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SOURCES OF CARBOHYDRATE FOR GERMINATION AND GROWTH OF ORCHID SEEDLINGS

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Ever since 1840, when Linck observed the endophytic fungus in orchid roots, the symbiotic relationship between these interesting plants has been studied by mycologists, plant physiologists, and horticulturists. We may roughly divide the research that has been done since 1840 into two main periods.

The first period consisted in efforts to verify the universality of the endophytic infection and to link this mycorrhizal condition with various phenomena of germination. Wahrlich ('86) was the first to establish the generality of the occurrence of the endophyte. He examined the roots of five hundred species of orchids and found all to be contaminated with a fungus which he held to be species of *Nectria*. Since the time of Wahrlich, the taxonomy of the fungal symbiont has passed through a complex and varied evolution, but a discussion of this phase of orchid research is beyond the scope of the present paper. The existence of the endophyte was further verified by Prillieux ('56, '60), Prillieux and Rivière ('56), and by Fabre ('56).

Bernard ('00) early suspected the relationship between the germination of orchid seeds and the presence of the endophyte. He obtained good germination on sawdust which was kept in the same greenhouse as the parent plants, and pointed out that this was probably due to an infection of the sawdust by the fungus from the parent plants. The publication of these results was followed by a number of other papers ('02, '03, '04, '06),

which further substantiated his opinions concerning the obligate relation between germination and the presence of a suitable fungus.

Burgeff ('09), in a monographic study of the various orchid endophytes, concluded, as had Bernard, that orchids were obligate symbiotic plants. He failed to recognize at that time the significance of his own experiment in which *Laelio-Cattleya* seeds germinated on a 0.33 per cent sucrose solution in the dark. The plants lived but ten months and further development either in the light or dark was impossible without the fungus. Had these cultures been exposed to light from the beginning, it is probable that he would have discovered the necessity of sugar rather than of the infected condition for normal development.

The second period of research began in a controversy over the possibility of germinating orchid seeds entirely asymbiotically. A complete review of this phase of the problem is without scientific interest. The writer cannot refrain, however, from quoting a sentence from Costantin ('26), which represents the resistance to the natural development of opinions from those of Wahrlich, Bernard, and Burgeff on the presence of the endophyte, to the latter views of Knudson on carbohydrate metabolism. Costantin said that Bultel was correct in saying that asymbiotic plants were normal externally, but—"Est-elle normale intérieurement? Non, si le champignon est absent: puisque sa présence est un des caractères de la vie normale de l'Orchidée."

The research dealing with the carbohydrate nutrition of plants grown entirely asymbiotically centers in the work of Knudson. Previous to Knudson, Bernard had obtained, in a few cases, germination of *Cattleya* and *Laelia* seeds asymbiotically on concentrated solutions of salep. He even suggested that some such method might be developed commercially. Salep is a preparation obtained by reducing the dried tubers of certain orchids to powder and contains (Knudson, '22) 48 per cent mucilage, 27 per cent starch, 5 per cent protein, and probably some sugar and mineral matter. However, it remained for Knudson ('22, '24, '25, '26, '27) to point out that the true significance of the mycorrhizal condition was in furnishing a source of carbohydrate to the orchid embryo and in maintaining a favor-

able degree of acidity. A paper by Knudson ('16), previous to his work on orchids, called attention to the fact that sugars had a favorable influence on the growth of higher plants. The results obtained in this work, together with data taken from Bernard and Burgeff, suggested that soluble organic substance might cause germination. Germination was obtained on an agar culture prepared by autoclaving 400 gms. of dormant canna tubers with 600 cc. of water. Germination also occurred, with varying degrees of excellence, on peat agar, carrot-root extract, beet extract, and sugars. A complete mineral nutrient solution to which sugars were added gave good development. Fructose and glucose were the sugars used, fructose proving to be the better.

Germination and growth were obtained asymbiotically with the addition of sugars by Clement ('24 a, b, '26, '29, '32), Ballion and Ballion ('24, '28), and Bultel ('24-'25, '26). Bultel ('25) mentioned that fructose was preferable to glucose, but no experimental data were given.

While the above authors, building chiefly on the work of Knudson, sufficiently established the possibility of growing normal plants in the presence of sugar in the absence of the endophyte, La Garde ('29) was the first to study systematically the comparative value of the different sugars. Using 2 per cent solutions of maltose, glucose, fructose, and sucrose, he found their comparative value to be maltose > fructose > glucose > sucrose. A year later, Quednow ('30) published his observations on a more extended list of sugars. He found the order of excellence to be glucose > fructose > sucrose > maltose > mannose > galactose > lactose. Smith ('32) used sucrose, glucose, and maltose, singly and in all sorts of combinations, and observed no apparent difference in the growth of the seedlings.

Unusual facilities for research have enabled the writer to extend the list of sugars which has been used for orchid germination to include the rarer and more expensive forms. This opportunity, together with the discrepancies between the work of La Garde, Quednow, and Smith, led to the present work. The sugars were added to three different complete mineral nutrient solutions in amounts to give 7 gms. of carbon per liter. The compositions of these solutions were as follows:

| Knudson's ('22) Solution | Shive's ('15) Solution | La Garde's ('29) Solution |
|--|--|--|
| MgSO ₄ .7H ₂ O .250 gm. | MgSO ₄ .7H ₂ O 4.930 gm. | MgSO ₄ .7H ₂ O 1.00 gm. |
| Ca(NO ₃) ₂ .4H ₂ O 1.000 gm. | Ca(NO ₃) ₂ .4H ₂ O 1.228 gm. | Ca(NO ₃) ₂ .4H ₂ O 1.00 gm. |
| (NH ₄) ₂ SO ₄ .500 gm. | KH ₂ PO ₄ 1.960 gm. | KH ₂ PO ₄ 1.00 gm. |
| K ₂ HPO ₄ .250 gm. | | CaCl ₂ 1.00 gm. |
| | | NH ₄ NO ₃ .50 gm. |
| | | (NH ₄) ₂ CO ₃ .H ₂ O .500 gm. |

Iron was added in all cases as 10 cc. of a M/200 suspension of FePO₄ prepared according to Livingston ('19) in a liter of nutrient solution. Both Knudson and La Garde added iron in such quantities as to cause a heavy precipitate of iron phosphate. La Garde states that this precipitate was filtered off before the final sterilization and contained, besides iron and phosphate ions, calcium and potassium. It seems unwise to cause this bulky precipitate because it tends to adsorb other ions which are removed with it in filtration. The quantity of FePO₄ added by the author does not cause appreciable precipitation at the hydrogen-ion concentration used. This reduced amount is undoubtedly sufficient in quantity, since it is ten times that originally recommended by Livingston. La Garde designates the iron compound used by him as Fe₃(PO₄)₂.8H₂O. Knudson ('22), Quednow ('30), and Smith ('32) also added iron as ferrous phosphate. Since it is well known that the ferrous ion in the presence of oxygen reduces nitrate to nitrite, the ferric ion was used in the present work.

The solutions were made up in liter flasks, and adjusted to pH 4.00 with HCl. All precipitate dissolved at this acidity, but there was a slight opalescence due to ferric phosphate. The solutions were then titrated by means of the quinhydrone electrode to such pH (see tables) that the values after sterilization were 4.8-5.1. Aliquots of 100-cc. portions were placed in 200-cc. Erlenmeyer flasks and 1.75 grams of Merck's Reagent Powdered Agar added. Sterilization was by autoclaving at twenty pounds pressure for twenty minutes. The medium was allowed to solidify in a slanting position.

It is extraordinarily difficult to maintain sterile cultures in warm moist atmospheres over long periods of time, and after many preliminary failures, the following plan was adopted. The solutions were added to the culture flasks through a funnel, care

being taken not to moisten the necks of the flasks. The flasks were then closed with cotton plugs. A duplicate set of cotton stoppers was carefully and tightly rolled, sterilized in empty flasks in the autoclave, and then immediately transferred to the dry-air oven until thoroughly dry. The seeds were shaken vigorously for thirty minutes in a small vial of calcium hypochlorite prepared as recommended by Wilson ('15). This vial was then clamped in a sloping position so that contaminating substances might not fall in from the air. A culture flask and an empty flask containing the especially prepared cotton plug were held in a horizontal position in the left hand. The temporary cotton plug was withdrawn from the culture flask and dropped. A platinum-loop inoculating needle, held in the right hand, was quickly flamed and a loopful of seeds transferred directly from the hypochlorite solution to the drop of moisture that always exudes from the solidified agar. The neck of the flask was then flamed and the especially prepared stopper quickly drawn from the blank flask and inserted in the culture flask. This procedure is advisable as it involves a minimum of exposure of the cotton plug that is finally used in the culture flask, and insures its perfect dryness.

The drop of moisture containing the seeds on the edge of the agar was then distributed around the entire margin by rotating the flask carefully. This even distribution of seeds was maintained by placing the flask in a rack so constructed that the agar surface was perfectly level, thus preventing the liquid drop from draining to one side and carrying the seeds with it. After a convenient number of flasks had been inoculated, the necks of the flasks were again flamed and the cotton plug well charred on the surface. The plugs and the outer surface of the necks were then moistened with saturated $HgCl_2$ solution. Heavy waxed paper was then dipped in the $HgCl_2$ solution, tightly wrapped around the stoppers and the upper part of the flask, and held firmly in position by rubber bands. The writer has found that unless these precautions are taken, fungi will frequently grow along the surface of the flask and penetrate the stopper, contamination usually not appearing until three or four months after inoculation. Bernard, certainly a well-trained and experienced

mycologist, has commented on the extraordinary difficulty of maintaining orchid cultures sterile in the moist warm atmosphere desirable for germination. By taking the above precautions, the writer has maintained sterile cultures as long as three years in moisture-saturated atmosphere at 25–35° C.

In every case, the cultures were prepared in triplicate. The seeds for the entire series were from a single pod of *Cattleya Trianae* Linden & Rchb. f. The flower was pollinated November

TABLE I
DATA OF KNUDSON'S SOLUTION

| Sugar | pH adjusted before sterilization | pH at time of planting | pH after supporting growth 8 months |
|------------------|----------------------------------|------------------------|-------------------------------------|
| d-glucose..... | 4.12 | 5.1 | 4.2 |
| d-fructose..... | 4.12 | 4.9 | 3.8 |
| d-galactose..... | 4.12 | 5.0 | No growth |
| d-mannose..... | 4.13 | 5.0 | 4.2 |
| l-xylose..... | 4.15 | 5.0 | No growth |
| l-arabinose..... | 4.10 | 5.0 | No growth |
| Maltose..... | 4.15 | 5.1 | 4.4 |
| l-rhamnose..... | 4.15 | 5.0 | No growth |
| Sucrose..... | 4.15 | 5.1 | 4.4 |
| Raffinose..... | 4.12 | 4.8 | 4.4 |

TABLE II
DATA OF SHIVE'S SOLUTION

| Sugar | pH adjusted before sterilization | pH at time of planting | pH after supporting growth 8 months |
|------------------|----------------------------------|------------------------|-------------------------------------|
| d-glucose..... | 4.12 | 5.1 | 4.4 |
| d-fructose..... | 4.12 | 4.9 | 4.0 |
| d-galactose..... | 4.12 | 5.0 | No growth |
| d-mannose..... | 4.13 | 5.0 | 4.5 |
| l-xylose..... | 4.15 | 5.0 | No growth |
| l-arabinose..... | 4.10 | 5.0 | No growth |
| Maltose..... | 4.15 | 5.1 | 4.6 |
| l-rhamnose..... | 4.15 | 5.0 | No growth |
| Sucrose..... | 4.15 | 5.1 | 4.5 |
| Raffinose..... | 4.12 | 4.8 | 4.4 |

TABLE III
DATA OF LA GARDE'S SOLUTION

| Sugar | pH adjusted before sterilization | pH at time of planting | pH after supporting growth 8 months |
|------------------|----------------------------------|------------------------|-------------------------------------|
| d-glucose..... | 4.25 | 4.9 | 3.5 |
| d-fructose..... | 4.24 | 4.8 | 3.8 |
| d-galactose..... | 4.22 | 4.8 | No growth |
| d-mannose..... | 4.24 | 4.9 | 3.8 |
| l-xylose..... | 4.24 | 4.9 | No growth |
| l-arabinose..... | 4.24 | 4.9 | No growth |
| Maltose..... | 4.25 | 4.9 | 4.2 |
| l-rhamnose..... | 4.22 | 4.9 | No growth |
| Sucrose..... | 4.24 | 4.9 | 4.1 |
| Raffinose..... | 4.51 | 4.9 | 4.2 |

27, 1930, and the matured pod harvested March 11, 1932, after a developmental period of over sixteen months. The inoculation of the culture media was made June 15, 1932, and the observations were recorded February 25, 1933, after a growth period of about eight months.

In the younger stages of development the diameter of the protocorm is an accurate basis for comparative determinations of growth, but after the seedling has developed leaves the growth is largely vertical rather than mere enlargement of the nearly round protocorm. Accurate measurements of the height of the young plant are difficult to obtain, since it is too large to measure by a microscope micrometer and too small for any less accurate means. For these reasons, seedlings as old as eight months can best be rated with the eye by comparing different culture flasks and sorting them into a few groups. The results of such a comparison after the growth period of eight months are shown in table IV. The relative excellence of the cultures is designated by the number of X's.

The results show that d-mannose produced definitely the best growth. This is followed by the group glucose-maltose-fructose, and this in turn by the third group sucrose-raffinose, and then l-xylose. No growth was obtained on d-galactose, arabinose, or rhamnose. A comparison of these results with the molecular

TABLE IV
GROWTH DATA

| Description of plants | Knudson's Mineral Solution | | Shive's Mineral Solution | | La Garde's Mineral Solution | |
|---|--|-------------------|---|--------------------------|--|------------------|
| | Sugar | Growth | Sugar | Growth | Sugar | Growth |
| Group I Exceptionally good growth and chlorophyll development | d-mannose | xxxx* | d-mannose | xxxxx | d-mannose | xxxx |
| Group II Moderately good growth and chlorophyll development | d-glucose maltose d-fructose | xxx xxx xxx | d-glucose maltose d-fructose sucrose | xxx xxx xxx xxx | maltose d-fructose | xx xx |
| Group III Poor growth and chlorophyll development | sucrose raffinose | xx xx | raffinose | xx | sucrose raffinose | xx xx |
| Group IV No growth | l-xylose d-galactose l-arabinose l-rhamnose | x 0 0 0 | d-galactose l-arabinose l-rhamnose | 0 0 0 | l-xylose d-galactose l-arabinose l-rhamnose | x 0 0 0 |

*The number of x's denotes the relative excellence of the cultures.

configuration of the respective sugars indicates that in but one physical characteristic do they show any consistent physiological action—and that is that the pentoses do not allow the germination and growth of orchid seedlings. It is not impossible that their quality of being levo-rotatory is related to their physiological reaction. The two instances in which l-xylose allowed growth are of doubtful authenticity. Only two or three seeds germinated in each flask, and these never developed beyond a very rudimentary protocorm. Such rudimentary development was occasionally noted even on sugar-free agar cultures, but in those cases also development never proceeded beyond a rudimentary protocorm. It is interesting to note that rhamnose, although it

has six carbon atoms, is structurally a methylated pentose and reacts physiologically to orchid seedlings as a pentose. Galactose, although an aldo-hexose, as is also d-mannose, supported no growth. These results are in approximate agreement with those of Quednow, cited above.

From the following considerations the author believes that the conspicuous superiority of d-mannose is of especial significance. Mannose, in the form of mannan, is known to be widely distributed as a constituent of the cell wall of many plants. This is particularly true of seeds (Onslow, '23). For example, various complex mannans have been found in the seeds of palms, asparagus, clover, coffee bean, onion, and various Leguminosae, Coniferae, and Umbelliferae. Mucilages are particularly rich in mannans, as, for instance, those obtained from lily bulbs (Parkin, '01) and tubers of various genera of Orchidaceae. Pringsheim and his coworkers ('24, '28) succeeded in isolating and studying mannan from orchid tubers. In this instance, it was water soluble and was precipitated by alcohol as a white powder. Klein ('32) gives a procedure for isolating mannan from salep itself.

Salep, a product of orchid tubers, has been used as a substrate for the orchid fungi and for germinating orchid seeds in the presence of some symbiotic fungus from the earliest days of orchid research. It therefore appears fairly certain that the fungal element of the orchid mycorrhiza is able to hydrolyze mannan to soluble mannose. In this way the symbiotic fungi could make available any mannose which might be present in the woody and mossy substrate of epiphytic orchids in their natural habitat. The extraordinary slowness of the development of orchid seedlings would be supported by the presence of only very small quantities of mannan.

The Missouri Botanical Garden has produced seedlings by the symbiotic method that surpassed in quality anything that the author has seen obtained by asymbiotic methods. In many instances the agar substrate consisted of the usual mineral substances and finely shredded cocoanut fiber. An appropriate fungus was inoculated on this medium some time before the seeds were sown. Seedlings grown on fungus-inoculated cocoanut-

fiber substrate always surpassed those grown on La Garde's maltose media. Bultel ('25) also found that symbiotic cultures gave superior results with all genera tested by him except *Phalaenopsis*. The nature of his substrate was not indicated.

The writer has already reported ('33) on the superior value of the La Garde mineral solution over other solutions, and it seems scarcely probable that symbiotic cultures could owe their superiority to any inorganic constituent. It is much more probable that the carbohydrate relationship is the important feature. Knudson has shown the effectiveness of orchid fungi in hydrolyzing starch to available sugar. Might not the superiority of the symbiotic cultures be due to the mannose produced by hydrolysis from the cocoanut fiber?

In order to determine the actual presence of mannans in cocoanut fiber, an analysis was carried out according to the method of Haegglund and Klingstedt ('24, '27). Ten gms. of cocoanut fiber were allowed to stand in 150 cc. of 72 per cent H_2SO_4 for $2\frac{1}{2}$ days. The mixture was then diluted with water and the acid neutralized with $CaCO_3$. The precipitate was filtered off, the residue washed on a suction filter, and the combined filtrate and washings were evaporated on the steam bath to 150 cc. Then H_2SO_4 was added to give a 2 per cent solution and the mixture boiled 2 hours. The acid was again neutralized with $CaCO_3$, then weakly acidified with $HC_2H_3O_2$, and evaporated to 100 cc. After cooling, 10 cc. of phenylhydrazine plus 20 cc. water were added and allowed to stand several days. A very definite precipitate of the insoluble phenylhydrazone was obtained, indicating the presence of mannose.

The above method is scarcely quantitative because of the difficulty of obtaining complete hydrolysis of mannans without causing their oxidation at the same time. The very heavy precipitate of $CaSO_4$, which is produced when the acid is neutralized with $CaCO_3$, is bulky and difficult to wash thoroughly.

The seedlings grown on La Garde's maltose solution equalled those of the same age originally obtained by La Garde. Hence the mannose cultures might be regarded as distinctly superior to those yet obtained by the use of a purely synthetic medium and approach in quality the best of the symbiotic cultures. It

is to be regretted, however, that this could not be verified positively by comparison, since seedlings of the same age grown symbiotically were not at hand.

The glucose cultures were also of high quality, particularly as to their green color. No trace of yellowness or of inferior chlorophyll development was observed in seedlings grown on this sugar.

It must be noted that superiority of symbiotic cultures may depend not only on a carbohydrate relation, but also on a favorable degree of acidity. Knudson has pointed out that satisfactory fungal symbionts maintain a favorable pH of the media for the germination of the seeds. The pH of asymbiotic media can, of course, be adjusted artificially, but the initial favorable acidity is difficult to maintain over long periods of time.

The author hopes that some worker equipped to carry both symbiotic and asymbiotic cultures simultaneously will test further the suggestion that symbiotic cultures owe their superiority to mannose and to the constantly favorable pH relationship.

SUMMARY

1. The growth of orchid seedlings over a period of eight months was observed on a series of sugars, each added to three different inorganic media in amounts to give seven grams of carbon per liter. The order of excellence of growth on the different sugars was: d-mannose > d-glucose > maltose > d-fructose > sucrose > raffinose.

2. No growth was obtained on d-galactose, and the pentoses, l-arabinose, l-rhamnose, and l-xylose. This inability of the pentose sugars to support growth may be related to their levorotating property. Galactose occupies an anomalous position.

3. Mannose gave conspicuously the better growth. This may be related to the fact that symbiotic cultures containing cocoanut fiber, an effective source of mannan, produce seedlings superior to any that the author has seen produced asymbiotically.

4. The mineral nutrient medium of La Garde plus d-mannose is regarded as the best asymbiotic culture medium for orchids, as shown by the reaction of *Cattleya Trianae* Linden and Rchb. f. seedlings.

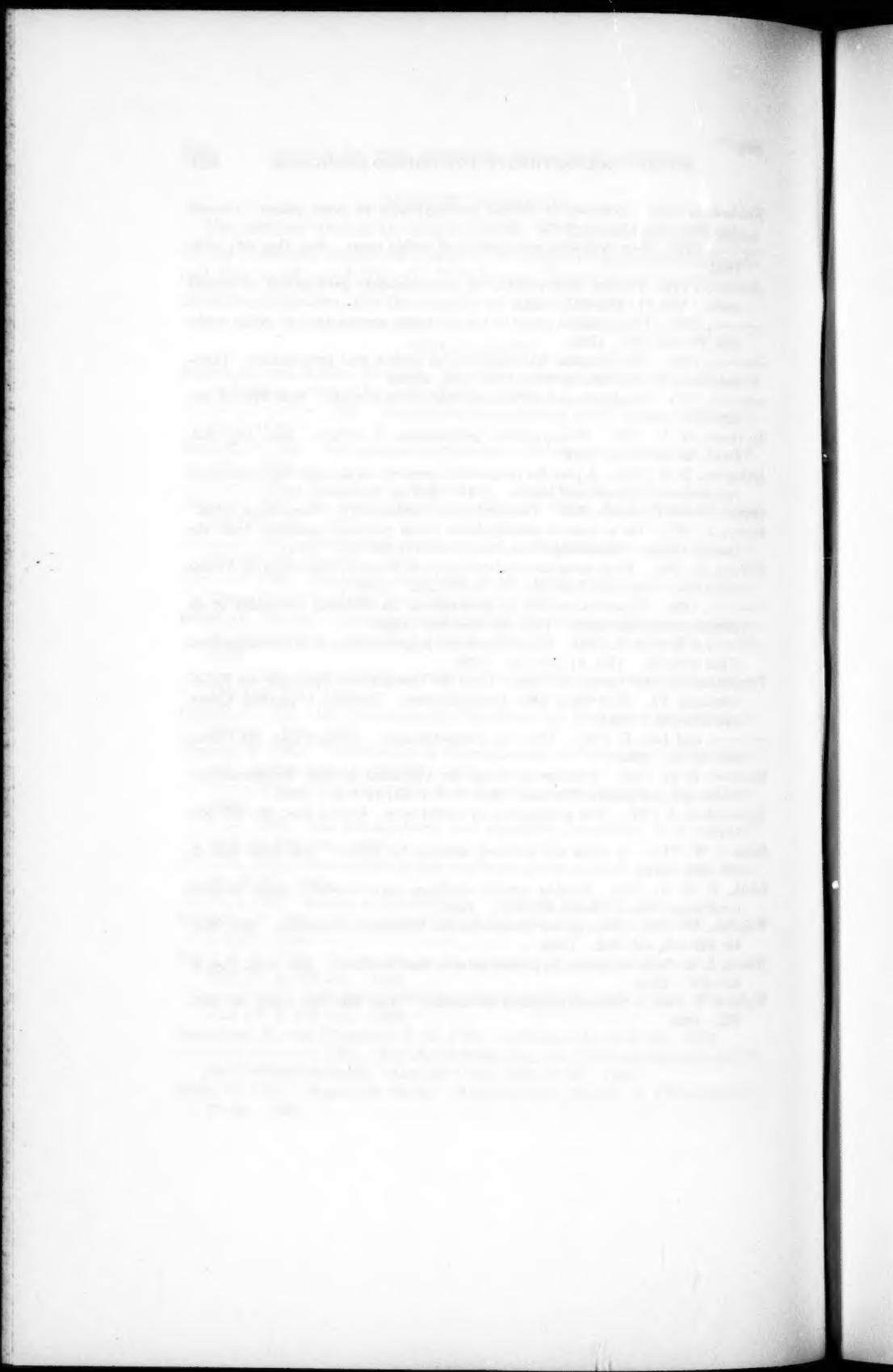
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SUPER OPTIMAL AND THERMAL DEATH
TEMPERATURES OF THE COTTON PLANT AS
AFFECTED BY VARIATIONS IN RELATIVE HUMIDITY¹

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HISTORICAL REVIEW

In 1863 Sachs reported the results of an attempt to determine the effects of high temperatures on the sensitivity of *Mimosa pudica*. Transitory insensitivity, he found, was caused by an exposure of one hour to a temperature of 40° C., and at 45° C. for a half hour and 49° C. for a very brief time the same effect was produced. When permanent insensitivity was attained, at higher temperatures, death invariably followed. Sachs also reported ('64) on the effects of high temperatures on tobacco, pumpkin, corn, nasturtium, and rape, exposed for various periods of time. All the plants were able to withstand temperatures of 49–51° C., but none survived 51° C. for more than 10 minutes without injury. The power of resistance to high temperatures was found to vary at different ages. Developing leaves, stems, and roots were more easily killed than older ones.

Ewart ('03) noted a decrease in the rate of protoplasmic streaming in *Elodea*, *Tradescantia*, *Chara*, *Spirogyra*, root hairs, pollen tubes, etc., depending upon the height of the temperature above the optimum and upon the length of exposure.

Pfeffer ('03) made the generalization that all turgid plants ultimately die when the temperature reaches from 1° to 2° C. above the maximum where the plant will grow indefinitely, although growth may continue for a time, and that at temperatures of 10° C. above this maximum all flowering plants seem to be rapidly killed. He noted that plants, which at first

¹ Portions of this work, together with certain microscopical studies of the treated plants, were submitted by Mrs. Dorothy Megowen Berkley as a thesis in partial fulfillment of the requirements for the degree of master of science in the Henry Shaw School of Botany of Washington University.

² A fellowship established by the American Creosoting Co.

appeared fresh and unharmed after a short exposure to fatally high temperatures, frequently died later as an after-effect, even under the best external conditions.

Fung ('11) emphasized the necessity of considering the relative humidity in determining the effects of high temperature on plants. He found the maximum temperature for growth of cotton to be 113° F. in a relative humidity of 90 per cent and the optimum 85–90° F. in a relative humidity of 70.6–72.2 per cent. Cotton plants treated for four hours in a saturated atmosphere at a variety of high temperatures also gave interesting results. At 42–45° C. the stems and leaves were badly wilted but recovered; at 44–48° C. the stems and leaves were browned but new leaves appeared after one week (probably secondary growth from uninjured nodes); at 49–55° C. the plants were killed. The degree of injury was determined after the plants had been transferred to "proper conditions," which were not described. The value of Fung's results is limited by the fact that he worked with an insignificant number of plants and used only very young seedlings. Bose ('13), who gave 60° C. as the average fatal temperature for plants in general, found the death point to be lower in young plants, which confirmed the earlier statement of Sachs.

Collander ('24) determined the temperatures at which death occurred in individual cells of various plants. *Tradescantia disolor* was killed at 65° C. within an average of 1.8 minutes, *Brassica oleracea* at 60° C. within an average of 0.8 minute, *Beta vulgaris* at 60° C. in 0.7 minute, *Draparnaldia glomerata* at 55° C. in 0.32 minute, and *Pisum sativum* at 55° C. in 0.095 minute. He found that these plants could live at slightly lower temperatures for some time, thus demonstrating that the thermal death point is suddenly reached. Lepeschkin ('25) discussed the effects of optimum, maximum, and thermal death temperatures on bacteria, fungi, and higher plants. He stated that most plants died at 60–70° C. in one minute, although some died at 40–45° C. in that time.

Gilbert ('26) found that cotton grew better at 80° F. in a relative humidity of 50 per cent than it did in a relative humidity of 85 per cent. Wallace ('31) tested the effect of 1–24-hour

exposures to temperatures ranging from 15 to 60° C. on the sensitivity of *Mimosa pudica*. Above 45° C. injury or death resulted, depending upon the length of the exposure. He reported that the relative humidity had little or no effect upon the sensitivity of the plant.

Baker ('29), in studying the effects of excessively high temperatures on conifer seedlings 1-3 months old, also emphasized the suddenness at which the thermal death point was reached. The living tissues were quickly killed at 54° C. but were uninjured after a prolonged exposure to a temperature only a few degrees lower. Just below the thermal death point he noted a region of no growth where photosynthesis was apparently unable to keep up with catabolic changes, the chlorophyll decomposing faster than it was made and the leaves becoming yellow or withered. On prolonged exposure the plants died. He also found the age of the plant to be a factor in resistance, due to the development of protective tissues as the plant grew older. The indications were that there was no increased protoplasmic resistance with age.

APPARATUS

Four glass cases of identical design and size (60 in. long by 32 in. wide by 40 in. high) were used for the experimental work. Three of these cases were variously used for growing plants, for germinating seeds, and for plants under observation following treatment. Additional plants were grown on benches in the experimental room.

The fourth case was converted into the electrically controlled temperature chamber (fig. 1). The experimental plants were placed in a flat of sand which rested on a lattice rack supported 12 inches above the bottom of the case. The heating units consisted of three heaters, two of which were controlled by ordinary switches, and were placed on the floor of the case, one in either half about midway between the center line and the end. They were composed of resistance wires wrapped on racks which extended practically the width of the case. With these two heaters there were three possible combinations: when the two were in parallel maximum heat was obtained, when one was used alone approximately one-half of the maximum could be had, and

when the two were in series one-fourth of the maximum. A further reduction in temperature was obtained by turning off these heaters altogether, leaving only the third heater which was composed of resistance wire wrapped on the guard-wires of an electric fan. This heater was controlled by a Thyratron¹ and relay combination which in turn was controlled by a thermostat with a mercury make-and-break contact.

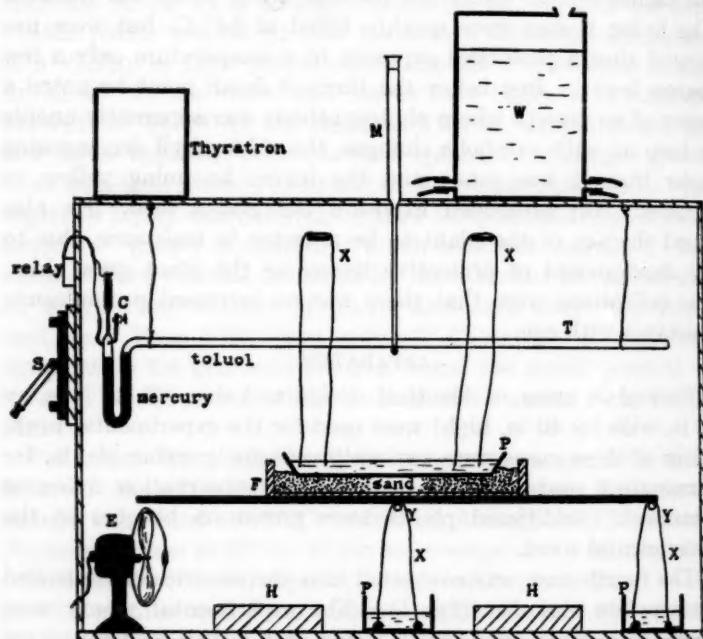


Fig. 1. Diagrammatic cross-section through the center of the controlled temperature chamber in which the plants were treated. C, capillary; E, electric fan heater; F, greenhouse flat; H, floor heaters; M, thermometer; P, water pans; S, switches; T, thermostat; W, water tank; X, humidifying cloths; Y, spray tubes.

The fan, which was located on the floor at one end of the chamber, was hooked directly to the current so that it ran continuously, blowing the warm air over the heaters and through

¹ Schmitt, F. O., and Schmitt, O. H. A. A vacuum tube method of temperature control. *Science N. S.* 73: 289-290. 1931.

humidifying cloths made of cheese-cloth. In this way the heat and moisture were uniformly distributed throughout the compartment. Good ventilation was assured by boring small holes in the frame of the compartment on either side of and in back of the fan.

The thermostat consisted of a glass tube extending the full length of the chamber, one end of which was shaped into a U terminating in a capillary. The main body of the tube had a capacity of about 200 cc. and was filled with toluol; the U tube, with a capacity of about 20 cc., contained mercury. The contact was made in the capillary in the usual manner. Due to the large capacity of this tube and the fact that it extended across the case at a level with the tops of the plants, it was possible to control the temperature within 0.5 of a degree.

The temperature of the chamber was determined by means of an incubator thermometer inserted through the top of the case, with its bulb reaching down to the level of the plants in the center.

For experiments run at high humidity, a practically saturated atmosphere was obtained by hanging from four pans at the top of the chamber strips of cloth which were kept supplied with water by tubes running from a tank above. These cloths drained into three pans below, one of which was placed in the flat of moistened sand and the others located on the floor. Additional cloths, through which the warm air from the fan was blown, extended the entire width of the temperature chamber below the rack and were moistened by constant sprays of water. An overflow in the bottom pans, which received most of the runoff water, was avoided by the use of constant-level siphons which carried off the surplus through drains in the floor.

Still other cloths were hung above either end of the pan in which the plants were placed, so that the pots of plants were not only standing in water but were more or less surrounded by moist cloths. Under these conditions the relative humidity was so high that the entire inner surface of the temperature chamber was covered with a film of water which dripped from the top and ran down the glass sides in streams.

For the low-moisture experiments, all humidifying devices were removed from the chamber.

Since there is no method devised at the present time for measuring the relative humidity at temperatures above 50° C., it was decided to measure the evaporating power of the atmosphere. This was done by the use of atmometers which consisted of two porous cups of the cylinder type connected to burettes on the outside of the chamber, all connections being made under water to eliminate air bubbles. These atmometers were carefully filled with boiled water, and placed on either side of the flat on which the plants were to be set. Notched corks were placed in the top of each burette to prevent evaporation at that point. After the chamber had been adjusted to a desired temperature, readings were made on the burettes at regular intervals. The results of these readings are shown in fig. 2.

At the high relative humidity, after the humidifying apparatus had been thoroughly adjusted, there was very little evaporation from the atmometers. Even at the higher temperatures, with no plants in the temperature chamber, there was less than 0.001 cc. evaporation per minute. These results give some indication of the conditions existing within the chamber, although it is not intended to imply that the plants lost water at exactly the same rate as the atmometers.

At temperatures below 50° C. an approximately saturated relative humidity for the higher moisture experiments and an average of 69 per cent for the lower moisture experiments were calculated from the readings of wet and dry bulb thermometers. When readings were made with the plants in the chamber, the relative humidity varied with the time of day, being as low as 55 per cent at night when transpiration was cut to a minimum and as high as 78 per cent at mid-day. Accordingly, most of the plants at the lower humidity were treated during the day. Since transpiration raised the relative humidity of the chamber, care was taken, when watering the plants in preparation for treatment, to keep the foliage dry and to allow the water to soak into the soil before placing them in the temperature chamber.

PROCEDURE

These experiments were made in order to determine the effects of humidity of super optimal and thermal death temperatures on

the cotton plant. They were suggested by the previous work of Berkley ('31) and the unpublished studies of Fung ('11). Cotton plants (variety Upland Big Ball) were grown in pots containing a mixture of sand and loam in a room of the greenhouse having a usual temperature of 25–30° C. Since individual variations made it necessary to use large numbers of plants of various ages, seeds were planted at frequent intervals from September, 1931, until the following September.

Two distinct series were run, one at a low, and the other at a high, relative humidity. The low-humidity experiments were made at temperatures between 42 and 84° C. inclusive, and those at the high humidity, between 40 and 65° C.

Plants of various ages (their ages being computed from the day the seeds were planted) were exposed to a particular temperature and humidity combination. After the chamber had been adjusted to the desired temperature, the plants were quickly passed through one of the glass doors, the slight drop in temperature occasioned by their entrance being quickly adjusted. They were removed after treatment to a compartment at room temperature which had a relative humidity similar to that of the treating chamber. The subsequent behavior of all plants treated was watched and the results noted. A minimum of 24 hours was allowed to elapse before the plants were pronounced dead. When the leaves and the growing tip of a plant were killed, it was called "dead" but was kept watered for some days to allow secondary growth to take place at the nodes in case the entire plant had not been killed. Such plants as did put forth secondary growth are listed in the tables. It will be noted that this was characteristic of the higher humidity experiments only.

SERIES I

Low humidity.—The plants treated at the lower relative humidity wilted to some extent before they were removed from the temperature chamber. When not too severely injured by excessive treatment, they revived and became turgid again immediately after removal. When treated for a longer time than was necessary to kill them, the wilted leaves and cotyledons temporarily regained their turgidity and to all appearances were

unharmed, but the petioles of the younger leaves, the stems just below the growing tips, and the hypocotyls of the seedlings were withered beyond recovery. After some hours, the time depending upon the intensity of the treatment, the injured portions of all plants, including those that temporarily recovered, dried up, only the cotyledons and leaves remaining green and turgid. These living organs, connected to the main stem of the plant only by dead tissue, remained in the green condition from 3 to 14 days before showing signs of death.

A microscopic study revealed no living tissue in the withered portions of the petioles and hypocotyls, but in the leaves and growing tips, which had recovered, the tissue was found to contain a number of mitotic figures. In the meristematic regions of the plants treated at times and temperatures just sufficient to kill them, the cell contents were disorganized.

Very few of the plants whose growing tips were killed put forth secondary growth at the nodes.

Tables I and II and fig. 3a give the detailed results of the lower humidity experiments. The thermal death point for the older plants treated at the lower relative humidity is in the neighborhood of 63° C., as shown by a sudden break in the line when the temperature is plotted against the time (fig. 3a). The time required to kill all of the plants at this temperature was about 7 minutes. The evaporation rate of the atmometer at 63° C. was 0.26 cc. per minute (fig. 2 and table II). If the plants were evaporating at a similar rate the cooling effect of the evaporation would be appreciable and would account for the greater length of time necessary to kill the plants at this temperature than at slightly higher temperatures.

The seedlings 10 days old or less had a slightly lower and more variable critical temperature (table I). The cotyledons and plumules showed about the same resistance as the older plants but the hypocotyls were permanently injured when treated for 8 minutes at 60° C. This injury to the hypocotyls ultimately caused the death of the entire plant.

In the older plants the petioles of the succulent young leaves were similarly affected but the plants were not killed unless the treatment was prolonged until the younger portion of the stem

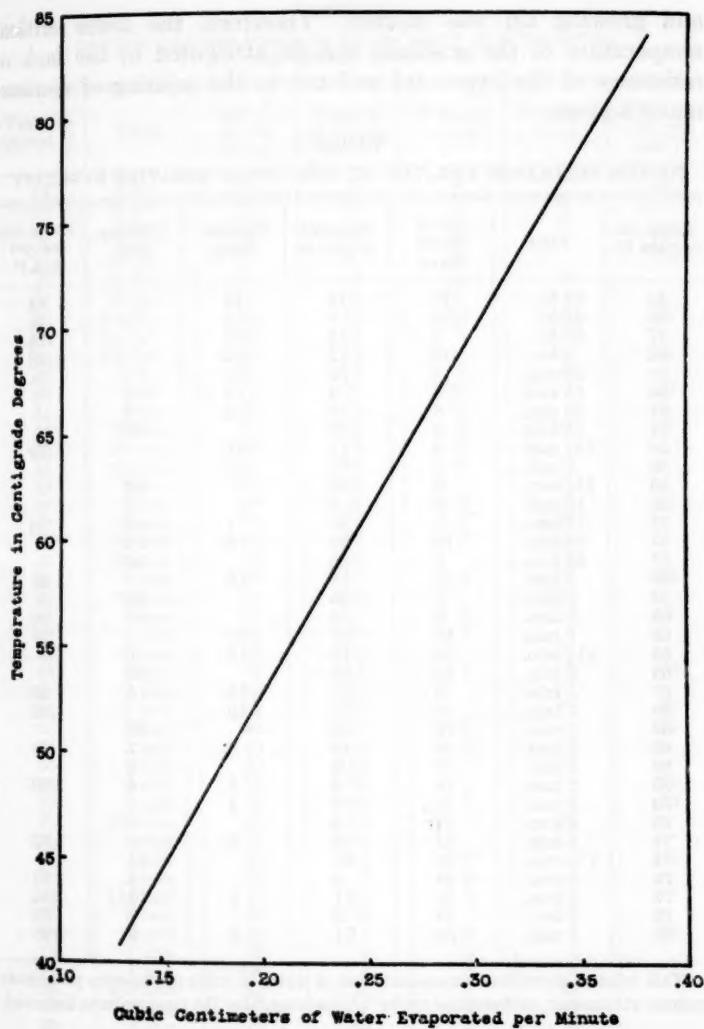


Fig. 2. The number of cubic centimeters of water evaporated per minute from an atmometer, plotted against the temperature in Centigrade degrees. The determinations were made at 10° intervals. The figures in table II relating to the evaporation rate were taken from this graph.

and growing tip was injured. Therefore, the lower critical temperature of the seedlings can be attributed to the lack of resistance of the hypocotyl and not to the injuring of meristematic regions.

TABLE I
COTTON SEEDLINGS TREATED AT THE LOWER RELATIVE HUMIDITY

| Temp. in degrees C. | Time | Age of plants (days) | Number of plants | Number living | Number dead | Evap. rate (cc. per min.)* |
|---------------------|---------|----------------------|------------------|---------------|-------------|----------------------------|
| 42 | 72 hr. | 10 | 12 | 12 | | .14 |
| 45 | 45 hr. | 24 | 9 | 6 | | .15 |
| 47 | 26 hr. | 9 | 15 | 15 | | .16 |
| 52 | 3 hr. | 10 | 12 | 12 | | .19 |
| 54 | 10 min. | 8 | 32 | 32 | | .21 |
| 54 | 15 min. | 8 | 6 | 1 | 5 | |
| 54 | 20 min. | 8 | 10 | 4 | 6 | |
| 54 | 45 min. | 8 | 20 | | 20 | |
| 56 | 2½ min. | 8 | 11 | 11 | | |
| 56 | 5 min. | 8 | 10 | 10 | | |
| 56 | 7½ min. | 8 | 10 | | 10 | |
| 56 | 10 min. | 8 | 8 | | 8 | |
| 57 | 15 min. | 8 | 40 | 1 | 39 | |
| 57 | 20 min. | 10 | 20 | 8 | 12 | |
| 57 | 35 min. | 8 | 66 | | 66 | |
| 60 | 5 min. | 10 | 15 | 15 | | .25 |
| 60 | 8 min. | 8 | 55 | | 55 | |
| 63 | 5 min. | 8 | 65 | | 65 | .26 |
| 65 | 1 min. | 10 | 17 | 17 | | .27 |
| 65 | 2½ min. | 10 | 15 | 6 | 9 | |
| 65 | 5 min. | 10 | 29 | | 29 | |
| 67 | 1 min. | 8 | 21 | 18 | 3 | .28 |
| 68 | 1 min. | 10 | 10 | 10 | | .29 |
| 68 | 2 min. | 10 | 40 | | 40 | |
| 69 | 1 min. | 10 | 10 | 8 | 2 | .29 |
| 69 | 2 min. | 10 | 9 | | 9 | |
| 70 | 1 min. | 10 | 6 | 1 | 5 | .30 |
| 70 | 2 min. | 10 | 6 | 4 | 2 | |
| 70 | 4 min. | 10 | 8 | | 8 | |
| 74 | 1 min. | 10 | 10 | 2 | 8 | .32 |
| 74 | 1½ min. | 10 | 21 | | 21 | |
| 75 | 1 min. | 10 | 4 | | 4 | .33 |
| 77 | 1 min. | 10 | 11 | 1 | 10 | .34 |
| 78 | 1 min. | 10 | 6 | | 6 | .35 |
| 80 | 1 min. | 10 | 11 | 3 | 8 | .36 |

*This column shows the evaporation rate of water in cubic centimeters per minute from an atmometer, as described under "Apparatus," for the temperatures indicated.

In order to determine the cause of this differential resistance of the hypocotyls and cotyledons an experiment was made to find the amount of water lost during treatment and during various periods of time following treatment. This was done by deter-

TABLE II
COTTON PLANTS FROM 16 TO 180 DAYS OLD TREATED
AT THE LOWER HUMIDITY

| Temp. in degrees C. | Time | Age of plants (days) | Number of plants | Number living | Number dead | Evap. rate (cc. per min.)* |
|---------------------|---------|----------------------|------------------|---------------|-------------|----------------------------|
| 42 | 24 hr. | 25 | 6 | 6 | | .14 |
| 42 | 48 hr. | 16 | 18 | 12 | 6 | |
| 42 | 72 hr. | 53 | 6 | 4 | 2 | |
| 45 | 2 hr. | 76 | 6 | 6 | | .15 |
| 47 | 18 hr. | 77 | 36 | 36 | | .16 |
| 47 | 26 hr. | 19 | 14 | 11 | 3 | |
| 47 | 26 hr. | 76 | 6 | 6 | | |
| 50 | 1½ hr. | 35 | 12 | 10 | 2 | .18 |
| 50 | 2¼ hr. | 35 | 12 | 3 | 9 | |
| 52 | 3¾ hr. | 55 | 48 | | 48 | .19 |
| 52 | 6 hr. | 25 | 12 | 9 | 3 | |
| 53 | 1 hr. | 78 | 28 | 28 | | .20 |
| 54 | 1 hr. | 23 | 12 | 12 | | .21 |
| 55 | 30 min. | 70 | 19 | 3 | 16 | .21 |
| 55 | 30 min. | 180 | 2 | 2 | | |
| 55 | 45 min. | 60 | 10 | 8 | 2 | |
| 55 | 1 hr. | 24 | 18 | | 18 | |
| 60 | 3 min. | 32 | 11 | 4 | 7 | .24 |
| 60 | 15 min. | 70 | 25 | 5 | 20 | |
| 60 | 20 min. | 70 | 27 | 2 | 25 | |
| 60 | 25 min. | 30 | 55 | | 55 | |
| 61 | 5 min. | 32 | 16 | 4 | 12 | .25 |
| 61 | 20 min. | 32 | 128 | | 128 | |
| 62 | 3 min. | 32 | 7 | 3 | 4 | .25 |
| 62 | 8 min. | 32 | 10 | 2 | 8 | |
| 62 | 10 min. | 32 | 50 | | 50 | |
| 63 | 5 min. | 72 | 14 | 2 | 12 | .26 |
| 63 | 7 min. | 72 | 18 | | 18 | |
| 64 | 5 min. | 32 | 82 | | 82 | .26 |
| 65 | 1 min. | 40 | 8 | 8 | | .27 |
| 65 | 2 min. | 40 | 8 | 4 | 4 | |
| 65 | 4 min. | 40 | 113 | | 113 | |
| 68 | 3 min. | 40 | 73 | | 73 | .29 |
| 70 | 2 min. | 70 | 16 | 2 | 14 | .30 |
| 70 | 2½ min. | 60 | 20 | | 20 | |
| 70 | 3 min. | 70 | 13 | | 13 | |
| 74 | 1 min. | 40 | 11 | 6 | 5 | .32 |
| 74 | 1 min. | 70 | 7 | 2 | 5 | |
| 74 | 1½ min. | 40 | 11 | 1 | 10 | |
| 74 | 2 min. | 40 | 10 | | 10 | |
| 78 | 1 min. | 40 | 11 | 2 | 9 | .34 |
| 78 | 1 min. | 70 | 4 | 3 | 1 | |
| 78 | 1 min. | 120 | 3 | 2 | 1 | |
| 78 | 1½ min. | 40 | 29 | | 29 | |
| 80 | 1 min. | 40 | 8 | 2 | 6 | .36 |
| 80 | 1 min. | 70 | 10 | 5 | 5 | |
| 80 | 1½ min. | 60 | 32 | | 32 | |
| 82 | 1 min. | 70 | 8 | 2 | 6 | .37 |
| 84 | ½ min. | 70 | 7 | 5 | 2 | .38 |
| 84 | 1 min. | 70 | 11 | 1 | 10 | |
| 84 | 1¼ min. | 60 | 10 | | 10 | |

*This column shows the evaporation rate of water in cubic centimeters per minute from an atmometer, as described under "Apparatus," for the temperatures indicated.

mining the average percentage of moisture in the hypocotyls and cotyledons of treated and untreated seedlings (table III). The treated seedlings had been exposed for 15 minutes to a temperature of 60° C., a treatment known to leave the cotyledons of most of the seedlings in a living condition for a week or ten days.

In all, five sets were run: in one, which was used as a control, the plants were weighed before treatment, in one they were weighed immediately after treatment, in one, after 2 hours, in one, after 24 hours, and in another, 96 hours after treatment. Before weighing, the seedlings were cut about one-half inch above the surface of the soil and again immediately below the junction of the cotyledons and the hypocotyls. The hypocotyls and cotyledons were weighed separately, dried, and reweighed.

The results (table III) show that the hypocotyls and cotyledons had approximately the same water content before treatment, but the cotyledons lost considerably more during the treatment (3.3 per cent loss in the cotyledons as compared with 0.2 per cent in the hypocotyls). During the first 2 hours the cotyledons still showed a slightly more rapid rate of loss than the hypocotyls, but after 24 hours they had regained more than 3 per cent, while the hypocotyls still continued to lose. After 96 hours the hypocotyls were very much withered, having an average of only 78.3 per cent moisture, while the cotyledons still retained an average of 87.4 per cent and were more or less turgid.

TABLE III

LOSS OF MOISTURE IN SEEDLINGS DURING AND AFTER TREATMENT
AT 60° C. FOR 15 MINUTES AT LOW RELATIVE HUMIDITY

| Number of plants | | Per cent loss of moisture in hypocotyls | Per cent loss of moisture in cotyledons |
|------------------|----------------------------------|---|---|
| 400 | Untreated..... | 92.2 | 92.1 |
| 200 | Treated & weighed immediately.. | 92.0 | 88.8 |
| 200 | Weighed 2 hours after treatment. | 91.1 | 87.7 |
| 200 | Weighed 24 hours after treatment | 88.2 | 90.8 |
| 200 | Weighed 96 hours after treatment | 78.3 | 87.4 |

SERIES II

High humidity.—Under the high humidity conditions also the seedlings showed a somewhat lower and more variable critical temperature than did the older plants. When first removed from the temperature chamber, neither the seedlings nor the

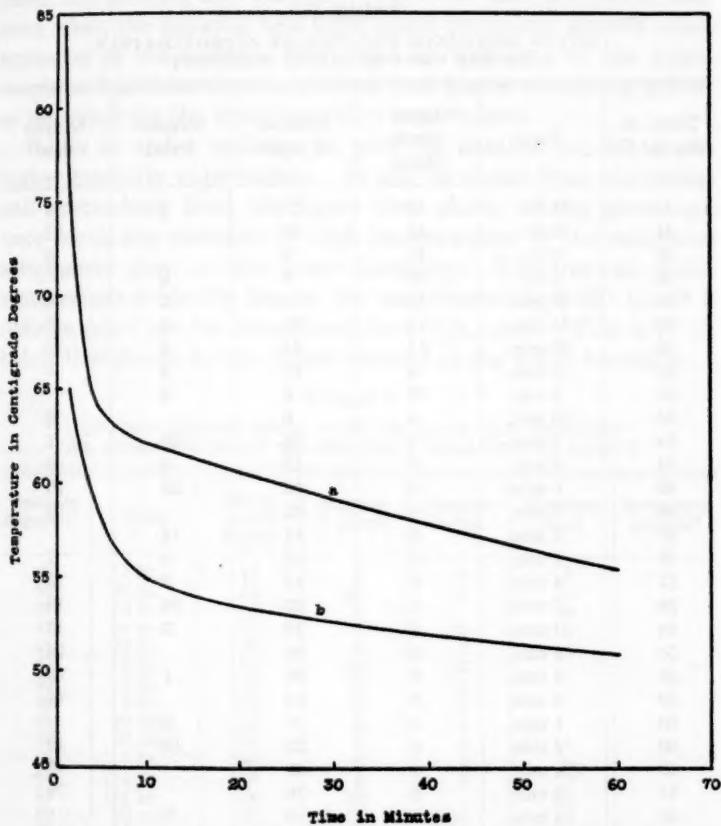


Fig. 3. The time in minutes necessary to kill all plants, plotted against the temperature in Centigrade degrees. The line (a) shows the results of the lower relative humidity experiments and (b) the results of the higher. Note the sharp break in (a). The lines in this graph are not drawn through any definite set of points but are plotted from tables II and V and are based upon the results obtained from the treatment of more than 4000 plants.

older plants showed any evidences of injury unless they had been left in the chamber for a period of time considerably longer than was necessary to kill them. In such a case, the young leaves and cotyledons appeared as if scalded. In the seedlings, injurious effects were later evidenced by the wilting or withering of the

TABLE IV
COTTON SEEDLINGS TREATED AT APPROXIMATELY
100 PER CENT RELATIVE HUMIDITY

| Temp. in degrees C. | Time | Age of plants (days) | Number of plants | Number living | Number dead |
|---------------------|---------|----------------------|------------------|---------------|-------------|
| 41 | 24 hr. | 12 | 22 | 4 | 18 |
| 41 | 48 hr. | 13 | 22 | | 22 |
| 42 | 9 hr. | 10 | 6 | | 6 |
| 45 | 2 hr. | 10 | 6 | 6 | |
| 50 | 30 min. | 14 | 12 | 2 | 10 |
| 50 | 45 min. | 14 | 21 | 4 | 17 |
| 50 | 60 min. | 14 | 24 | 8 | 16 |
| 52 | 10 min. | 8 | 11 | 9 | 2 |
| 53 | 5 min. | 15 | 6 | 6 | |
| 53 | 10 min. | 9 | 6 | | 6 |
| 54 | 3 min. | 8 | 21 | 20 | 1 |
| 54 | 5 min. | 8 | 15 | 6 | 9 |
| 55 | 5 min. | 8 | 48 | 25 | 23 |
| 55 | 7 min. | 8 | 23 | | 23 |
| 57 | 2 min. | 8 | 14 | 14 | |
| 57 | 3 min. | 8 | 15 | 8 | 7 |
| 57 | 4 min. | 8 | 15 | 2 | 13 |
| 58 | 2 min. | 8 | 25 | 15 | 10 |
| 58 | 3 min. | 8 | 16 | 3 | 13 |
| 58 | 5 min. | 8 | 20 | | 20 |
| 59 | 3 min. | 8 | 23 | 1 | 22 |
| 59 | 5 min. | 8 | 14 | | 14 |
| 60 | 1 min. | 8 | 8 | 8 | |
| 60 | 2 min. | 8 | 22 | 12 | 10 |
| 60 | 2½ min. | 8 | 40 | | 40 |
| 61 | 2 min. | 8 | 79 | | 79 |
| 62 | ½ min. | 8 | 9 | 9 | |
| 62 | ¾ min. | 8 | 14 | | 14 |
| 62 | 1 min. | 8 | 37 | 3 | 34 |
| 62 | 2 min. | 8 | 24 | | 24 |
| 63 | ¾ min. | 8 | 45 | | 45 |
| 64 | ½ min. | 8 | 54 | | 54 |
| 65 | ½ min. | 8 | 28 | | 28 |

cotyledons, followed either by their abscission or by the drying up of the whole plant, the amount of injury and the time of its appearance depending upon the severity of the treatment. In older plants, injury appeared in the form of flaccidly wilted leaves and blackened growing tips which proved to be dead. In all cases, the growing tips were more resistant than the leaves, and even when the growing tips were killed secondary growth often appeared at the nodes. There was no withering of the hypocotyls and petioles (the cotyledons and leaves remaining green) as described for the lower humidity experiments.

Tables IV and V and fig. 3b give the detailed results of the higher humidity experiments. It will be noted from the tables and particularly from the figure that plants of any given age were much less resistant to high temperatures in the saturated atmosphere than at the lower humidity. The thermal death temperature evidently lies in the neighborhood of 55° C., if a definite point can be determined from this curve. This is 8° C. below that shown by the plants treated at the lower humidity.

TABLE V
COTTON PLANTS FROM 18 TO 120 DAYS OLD TREATED
AT APPROXIMATELY 100 PER CENT RELATIVE HUMIDITY

| Temp. in degrees C. | Time | Age of plants (days) | Number of plants | Number living | Number dead | Secondary growth* |
|---------------------|---------|----------------------|------------------|---------------|-------------|-------------------|
| 40 | 7 hr. | 18 | 8 | 5 | 3 | |
| 40 | 10 hr. | 19 | 30 | 7 | 23 | |
| 40 | 12 hr. | 19 | 6 | | 6 | |
| 41 | 24 hr. | 50 | 30 | 24 | 6 | |
| 41 | 72 hr. | 50 | 6 | 2 | 4 | |
| 42 | 9 hr. | 35 | 26 | 26 | | |
| 45 | 2 hr. | 40 | 18 | 18 | | |
| 46 | 2 hr. | 18 | 12 | 12 | | |
| 48 | 20 min. | 26 | 6 | 6 | | |
| 48 | 40 min. | 26 | 6 | 5 | 1 | |
| 48 | 1 hr. | 26 | 6 | 2 | 4 | |
| 48 | 1½ hr. | 26 | 6 | 3 | 3 | |
| 48 | 1¾ hr. | 26 | 38 | | 38 | |
| 50 | 30 min. | 77 | 14 | 11 | 3 | |
| 50 | 45 min. | 77 | 19 | 13 | 6 | 6 |
| 50 | 1 hr. | 77 | 38 | 17 | 19 | 19 |
| 52 | 10 min. | 72 | 11 | 11 | | |
| 53 | 5 min. | 26 | 6 | 1 | 5 | |
| 53 | 5 min. | 36 | 6 | 3 | 3 | |
| 53 | 10 min. | 35 | 102 | | 102 | |
| 54 | 3 min. | 72 | 11 | 11 | | |
| 54 | 5 min. | 70 | 4 | 2 | 2 | 2 |

TABLE V—Continued

| Temp. in degrees C. | Time | Age of plants (days) | Number of plants | Number living | Number dead | Secondary growth* |
|---------------------|---------|----------------------|------------------|---------------|-------------|-------------------|
| 54 | 10 min. | 50 | 55 | | 55 | |
| 55 | 3 min. | 30 | 18 | 2 | 16 | |
| 55 | 5 min. | 120 | 2 | 2 | | |
| 55 | 7 min. | 72 | 10 | 10 | | |
| 55 | 9 min. | 60 | 8 | | 8 | |
| 56 | 5 min. | 72 | 28 | 7 | 21 | 5 |
| 57 | 2 min. | 73 | 2 | 1 | 1 | 1 |
| 57 | 4 min. | 73 | 4 | | 4 | 2 |
| 58 | 2 min. | 73 | 7 | 3 | 4 | |
| 58 | 3 min. | 70 | 4 | 3 | 1 | 1 |
| 58 | 4 min. | 70 | 16 | 12 | 4 | |
| 58 | 5 min. | 60 | 15 | | 15 | |
| 59 | 2 min. | 70 | 6 | 1 | 5 | 4 |
| 59 | 3 min. | 70 | 5 | | 5 | |
| 59 | 5 min. | 73 | 11 | 1 | 10 | |
| 60 | 1 min. | 73 | 1 | 1 | | |
| 60 | 2½ min. | 120 | 3 | 3 | | |
| 60 | 3 min. | 73 | 15 | 6 | 9 | 2 |
| 60 | 4 min. | 60 | 9 | | 9 | |
| 61 | 1½ min. | 75 | 3 | 1 | 2 | |
| 61 | 2 min. | 73 | 10 | | 10 | |
| 62 | ½ min. | 73 | 5 | 5 | | |
| 62 | ¾ min. | 73 | 8 | 5 | 3 | 2 |
| 62 | 1 min. | 73 | 26 | 2 | 24 | 3 |
| 62 | 2 min. | 72 | 8 | 5 | 3 | 2 |
| 62 | 2½ min. | 60 | 10 | | 10 | |
| 62 | 3 min. | 72 | 11 | | 11 | 3 |
| 63 | ¾ min. | 73 | 6 | | 6 | 4 |
| 63 | 1 min. | 73 | 3 | 1 | 2 | |
| 63 | 1¼ min. | 73 | 4 | | 4 | 1 |
| 64 | ½ min. | 73 | 9 | | 9 | 4 |
| 64 | 1 min. | 73 | 12 | | 12 | 3 |
| 65 | ½ min. | 73 | 2 | 2 | | |
| 65 | ¾ min. | 73 | 6 | 1 | 5 | 4 |
| 65 | 1 min. | 73 | 5 | 2 | 3 | |
| 65 | 1¼ min. | 60 | 10 | | 10 | |

*This column shows the number of plants that put forth secondary growth at the nodes after the growing tips had been killed.

DISCUSSION

When the data of the two sets of plants were compared, it was found that the cotton plant was much more resistant to high temperatures under the lower-humidity conditions. Furthermore, the nature of the injury and the parts of the plant first to be affected were entirely different in the two sets. At the lower relative humidity, the petioles, young stems, and the hypocotyls were the first to be killed, whereas at the higher relative humidity they were the last to be affected, the leaves and cotyledons

dying first. The seedlings treated at the lower relative humidity were invariably killed by injury to the hypocotyls.

Experiments showed that the cotyledons of the seedlings treated at the lower relative humidity lost moisture at a much greater rate than the hypocotyls during the treatment. Immediately following their removal from the temperature chamber the hypocotyls lost moisture rapidly while the cotyledons regained a large percentage of that lost during treatment. This would indicate that the evaporation of the water immediately utilized enough of the heat energy around the leaves and cotyledons to protect them until the other portions became injured and even killed. This assumption is further substantiated by the fact that all plants were so readily killed in the saturated atmosphere where transpiration was reduced to a minimum.

These experiments tend to prove the statement first made by Sachs ('64) and later by Ewart ('03) and Baker ('29) that reduced transpiration allows a more rapid concentration of heat in the plant. This phenomenon has not been emphasized by sufficient experimental data to show its true significance, and apparently not in any case has it been previously demonstrated under the conditions of thermal death temperatures. Clum ('26) claimed that this cooling effect was greatly over-estimated, but his experiments on thermal death temperatures were not sufficiently well controlled to justify his statement.

In the light of the facts shown by the present experiments it is evident that the thermal death point has not as yet been clearly defined. It will be necessary to limit the term to the death of the protoplasm alone and not to the entire plant. The death of the plant might be caused by the injuring or killing of some portion or organ which would prevent normal functioning, as shown by the seedlings treated at the lower relative humidity.

Local injury which is not outwardly evidenced may occur at temperatures below that designated as the thermal death temperature. Litardière ('25), working with onion root tips, found that the nuclei were affected at 48° C. after 24 hours and that the injury increased with higher temperatures even for shorter periods of time. Yamaha ('27) gave 38° C. as a critical temperature for the root tips of the bean, and Milovidov ('32), working

with a number of different plants, found that temperatures around 45-47° C. were injurious to the plants studied if the treatment were prolonged. The cursory microscopic studies made on the cotton plants in the present work showed that temperatures of 55° C. and above, even for very short periods of time, were injurious to the protoplasm, causing plasmolysis and deformation of the nuclei. Since these were not uniformly distributed in the plant it would be difficult to estimate their ultimate effects.

Blackman's idea of the "extinction temperature"¹ ('05) necessitates the setting of an arbitrary time limit which, in the opinion of the writers, is not justified since the time required for the protoplasm itself to assume the thermal death temperature would vary with atmospheric conditions under which the plants were treated.

At present no entirely satisfactory definition of the thermal death point can be given, but the following may serve until more data is available: *The thermal death point is that temperature which, at a given relative humidity, will kill the protoplasm immediately upon its assumption.* Were it not for the indication that humidity has an effect in addition to preventing cooling caused by the retardation of the transpiration rate, it would be possible to eliminate from the definition the qualifying phrase dealing with humidity. If the humidity had no other effects it would merely vary the time required for the plant cells to assume the temperature necessary to kill the protoplasm. This does not appear to be the fact, however, since there is so much difference between the low- and high-humidity experiments. It is likely that the extremely high relative humidity has an additional effect, that of smothering the plants. When plants from an atmospheric temperature of 25-30° C. were abruptly transferred into a temperature of 50-60° C. and a practically saturated atmosphere, condensation immediately took place on the surface of the leaves and stems. By reducing the transpiration stream

¹ " . . . we ought to find a temperature at which the earliest estimation that could be actually made would give no measurable assimilation. The lowest temperature to give this result might be called the 'extinction temperature' . . . (say in 100 seconds, for the accepted specific extinction temperature would of course have to be arbitrarily defined in time units)."

and the usual exchange of gases, this film of water would naturally limit the oxygen supply of the plant. Since plants in the higher temperature would demand more oxygen than could be obtained, it is possible that the protoplasm was killed by a combination of factors. The evaluation of the extent and full importance of this smothering effect will necessitate further experimentation.

In regard to the time limit as a criterion of the thermal death point, we must consider the factors influencing the rapid change of temperature of the plants from that of the atmosphere in which they were grown to that of the treating chamber. Some of these factors are transpiration in the plant, condensation of moisture on its surface, and temperature gradients immediately around the plants. Temperature gradients can be prevented by keeping the air thoroughly mixed, but it is very difficult to determine the exact relations of transpiration or condensation and the change in temperature of the protoplasm.

An examination of fig. 3a shows a sharp break in the line between 60 and 65° C., which marks the critical temperature for the cotton plant at the low relative humidity. A thermal death temperature of 63° C. may then be chosen, but that is the temperature of the atmosphere. It will be noted that it took from 5 to 7 minutes to kill the plants at 63° C. and progressively shorter intervals of time as the temperature increased, which would indicate that the protoplasm died immediately upon assuming the temperature of the atmosphere. The time lag, caused primarily by the cooling effect of transpiration, makes it necessary either to determine the exact temperature of the protoplasm or, more simply, to plot the temperature against the time and determine from the graph thus obtained the approximate thermal death point.

It is true that prolonged temperatures below 63° C. will kill the plants, but it is also evident from the slope of the upper portion of the line that it did not take, for example, 25 minutes for the protoplasm to assume a temperature of 60° C. when treated at this temperature. Then they were killed gradually, and in such a case the reactions set up by the high temperatures may have led to the death of the protoplasm.

It may be concluded that no definite temperature can be set

as the thermal death point of the cotton plant without stating first the atmospheric conditions under which the plants were treated and giving the ages of the plants. Transpiration plays a definite role in the cooling of the leaves and cotyledons under low relative humidity conditions.

SUMMARY

1. Two series of cotton plants 5 to 180 days old were exposed to super optimal and thermal death temperatures for periods of time ranging from $\frac{1}{2}$ minute to 72 hours. In Series I the plants were exposed to temperatures of 42–84° C. at an average relative humidity of 69 per cent at temperatures below 50° C. The evaporation rate was substituted for relative humidity in this series. In series II the plants were exposed to temperatures of 40–65° C. at an approximately saturated atmosphere.
2. Seedlings were less resistant to high temperatures at any given relative humidity than older plants.
3. The plants were less resistant to high temperatures at the higher relative humidity.
4. At the higher relative humidity, the leaves and cotyledons were the first parts of the plant to be affected.
5. At the lower relative humidity, the hypocotyls of the seedlings and the petioles and young stems of the older plants were the first to be affected.
6. During treatment at the lower humidity, the cotyledons lost water rapidly whereas the hypocotyls lost very little. After removal from the treating chamber the cotyledons regained a large percentage of the water lost and became turgid again, whereas the hypocotyls continued to lose moisture until they were completely withered.
7. The more rapid rate of transpiration in the cotyledons apparently utilized sufficient heat energy to protect them from being noticeably injured until the hypocotyls were killed. These data tend to substantiate the theory that the cooling effect of transpiration is of great value to plants in preventing an accumulation of heat energy.
8. The saturated atmosphere of Series II appeared to have an additional effect, that of smothering the plants. This was

apparently due to the retardation of the gas exchange caused by the condensation of moisture on the surface of the plants, thus reducing the oxygen supply.

9. Due to the two-fold effects of humidity the following is given as a tentative definition of the thermal death point: The thermal death point is that temperature which, at a given relative humidity, will kill the protoplasm immediately upon its assumption.

10. No definite temperature can be given as the thermal death point of the cotton plant without stating the humidity of the atmosphere and the age of the plant.

The writers wish to express their appreciation to Dr. E. S. Reynolds, Physiologist to the Missouri Botanical Garden, for suggestions and criticisms given during the progress of the work.

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STUDIES IN THE APOCYNACEAE. IV

THE AMERICAN GENERA OF ECHITOIDEAE

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INTRODUCTION

Because of their diverse and highly complicated floral mechanism, the American genera of the subfamily Echitoideae are at present perhaps the most imperfectly understood of Apocynaceae. As in pre-Linnean and early post-Linnean times laticiferous herbs of several distinct affinities were grouped indiscriminately under the name "Apocynum," so even to-day practically any echitoid liana indigenous to the western hemisphere may pass as a species of the inclusive genus *Echites* P. Br., although several excellent genera have been segregated from that amorphous and heterogeneous aggregate by Bentham, Robert Brown, Alphonse de Candolle, Mueller-Argoviensis, and other eminent systematists. To the less exacting botanical public, however, *Echites* has remained a convenient catch-all, and species of very dubious congenericity have been described and redescribed under that name until the literature has become so involved that it is a dangerous task to attempt routine determinative work, and much more so to essay the description of novelties.

The Apocynaceae of the western hemisphere attain their greatest complexity in tropical South America. Although monographic work hinting of any degree of finality upon most groups of tropical American plants had best be deferred for the future because of the incomplete state of our knowledge concerning the flora of that region, constant exploration in behalf of varied interests is bringing to the attention of science increasing multitudes of plants which must be critically identified by the systematic botanist. In order to facilitate that activity and to render the results more sure with respect to the numerous representatives of Apocynaceae, it has been considered highly desirable to undertake at this time a tentative revision of the troublesome Echitoideae.

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The most perplexing problem, as well as that first encountered in the course of such a revision, as has already been intimated, concerns generic relationships. The first requirement of a revision of the American Echitoideae should be the careful delimitation of the genera most deserving of recognition, and their epitomization in the form of an identificatory key. The second problem, of necessity wholly dependent upon the first, is that of a separate revision of each genus maintained within the subfamily.

In order to judge and to correlate more competently the numerous genera which have been proposed from time to time, the morphology of certain critical vegetative and floral organs has been investigated and interpreted in separate reports which are in preparation for publication in the near future. Only a brief account of the structural features employed as classificatory criteria is included here as an aid in the use of both generic and specific keys. It may be well to point out at this time that the limits of the subfamily Echitoideae as accepted in this instance are those established in the first paper of this series¹ to the exclusion of the genera of Apocynoideae characterized by pollen maintained within persistent tetrads.

For the purely taxonomic portion of the revision, recourse has been had to the extensive collections of most of the principal herbaria of America and Europe. Since it is believed that such inclusions generally enhance the value of taxonomic studies, exsiccatae have been freely cited, particularly in the instance of difficult or little-known species. The herbaria where specimens have been examined or obtained for study, together with the symbols employed in their citation, are as follows: Arnold Arboretum of Harvard University, Jamaica Plain (AA); Botanischer Garten zu Berlin-Dahlem (B); Museo Nacional de Buenos Aires (BA); Herbier Boissier, Institut Botanique de l'Université, Geneva (BB); British Museum (Natural History), London (BM); Jardin Botanique de l'État, Brussels (Bx); Botanisk Museum, Copenhagen (C); California Academy of Sciences, San Francisco (CA); Lindley Herbarium, Botany School, Cambridge, Engl. (Camb.); Delessert (D) and de Candolle (DC) herbaria, Con-

¹ Woodson, R. E., Jr. Ann. Mo. Bot. Gard. 17: 9. 1930.

servatoire Botanique, Geneva; Field Museum of Natural History, Chicago (FM); Gray Herbarium of Harvard University, Cambridge, Mass. (G); Royal Botanic Gardens, Kew (K); Linnaean Society of London (Linn.); Dudley Herbarium, Leland Stanford Junior University, Palo Alto (LS); Botanisches Museum, Munich (M); Missouri Botanical Garden, St. Louis (MBG); Museo Comercial de Venezuela, Caracas (MC); Muséum National de l'Histoire Naturelle, Paris (MP); New York Botanical Garden, New York City (NY); Academy of Natural Sciences of Philadelphia (PA); Pomona College, Claremont (PC); Naturhistoriska Riksmuseum, Stockholm (S); Botanisch Museum, Rijks Universiteit, Utrecht (U); University of California, Berkeley (UC); United States National Herbarium, Washington (US); Naturhistorisches Museum, Vienna (V). To the curators and members of the staff of these institutions, as well as to many other friends, the writer would express his gratitude for innumerable instances of aid and good will. He is also greatly indebted to the Board of Trustees and to the Director of the Missouri Botanical Garden for the privilege of a trip to Central America in 1930 for observation and study.

HISTORICAL REVIEW

None of the species which are now comprised within the American genera of Echitoideae was known to Linnaeus at the time of publication of the first edition of the 'Species Plantarum' in 1753 or of the fifth edition of the 'Genera Plantarum' the year following. In 1756, however, Patrick Browne² inaugurated the genus *Echites*, citing rather full distinguishing characters, but failed to assign a binomial species. The single polynomial referred to the genus by Browne, "*Echites foliis ovatis nitidis venosis; floribus herbaceis*," was founded upon a plant well illustrated by Sir Hans Sloane,³ and quite clearly establishes the common species of the Greater Antilles, the Bahamas, the peninsula of Yucatan, and southern peninsular Florida, *E. umbellata* Jacq., as the type of the genus as we shall deal with it here.

²P. Br. Hist. Jam. 182. 1756.

³"*Apocynum scandens majus, folio subrotundo*," Sloane, Nat. Hist. Jam. 1: 207. pl. 131, fig. 8. 1707.

The monotypic genus *Echites* as defined by Browne was interpreted by Linnaeus⁴ in the tenth edition of the 'Systema' merely as constituting a species of *Tabernaemontana*, and the former generic name was employed as a substantive adjective.

Four years after its first publication, the genus *Echites* was expanded by Jacquin⁵ to include ten species: *E. biflora*, *E. umbellata*, *E. agglutinata*, *E. trifida*, *E. quinquangularis*, *E. suberecta*, *E. torosa*, *E. repens*, *E. spicata*, and *E. corymbosa*. In 1763, Jacquin⁶ maintained the species which he had described three years previously, illustrating each in an admirable manner. Of the ten enumerated, which are now distributed among nine well-known genera, all but three were original. For *E. umbellata*, Jacquin⁷ was able to cite four pre-existing polynomials, two for *E. suberecta*,⁸ and one each for *E. torosa*,⁹ and *E. biflora*.¹⁰

In the second edition of the 'Species Plantarum' Linnaeus¹¹ included *Echites* within the "Pentandria Monogynia," and appended the ten species of Jacquin. Two years subsequently the genus also appeared in the sixth edition of the 'Genera Plantarum'.¹²

It would be a weary task to record in detail the great enlargement of the genus *Echites*, which almost immediately followed its original publication, to include scores of Apocynaceous species of the subfamily Echitoideae native to nearly all parts of the

⁴ L. Syst. Nat. ed. 10. 945. 1759.

⁵ Jacq. Enum. Syst. Pl. Carib. 13. 1760.

⁶ Ibid. Select. Stirp. Am. Hist. 1: 30-35; 2: pls. 21-30. 1763.

⁷ "Echites scandens foliis ovatis nitidis venosis; floribus herbaceis," P. Br. Hist. Jam. 182. 1756; "Apocynum scandens folio cordato, flore albo," Catesb. Nat. Hist. Carol. 1: 58. pl. 58. 1754; "Apocynum scandens majus, folio subrotundo," Sloane, Nat. Hist. Jam. 1: 207. pl. 131, fig. 2. 1707; "Periploca alia, floribus ampliis circinatis & crispis, seu Nerium scandens, radice Bryoniae tuberosae," Plum. Pl. Am. 210. pl. 216, fig. 2. 1759.

⁸ "Apocynum scandens, amplio flore villoso, luteo, siliquis angustissimis," Plum. Cat. Pl. Am. 2. 1703; "Apocynum erectum, fruticosum, flore luteo maximo & speciosissimo," Sloane, Nat. Hist. Jam. 1: 206. pl. 130, fig. 2. 1707.—The former appears to apply somewhat more obviously to *E. biflora* Jacq.

⁹ "Nerium sarmentosum, scandens, ramulis tenuibus, folliculis gracilibus luteis," P. Br. Hist. Jam. 181. pl. 16, fig. 2. 1758.

¹⁰ "Apocynum scandens, flore nerii albo," Plum. Deser. Pl. Am. 82. pl. 96. 1693.

¹¹ L. Sp. Pl. ed. 2. 307. 1762.

¹² L. Gen. Pl. ed. 6. 117. 1764.

world.¹³ The result was soon so obviously conglomerate that in 1811, in his treatise "On the Apocynaceae," Robert Brown¹⁴ recommended the limitation of the generic name to the species of the western hemisphere, distinctly citing *E. umbellata* Jacq. as the original species. Although, unfortunately, he did not attempt to redefine the characters of *Echites*, Brown described in the same work¹⁵ the genus *Prestonia*, which is therefore the second of the American genera of Echitoideae in point of age.

Since 1811, the publication of American genera of the sub-family Echitoideae has constantly augmented. Summarized chronologically in tabular form, the appearance of genera from 1756 until the present has been as follows:

- 1756 *Echites* P. Br. Hist. Jam. 182. 1756; Jacq. Enum. Syst. Pl. Carib. 13. 1760.
- 1811 *Prestonia* R. Br. Mem. Wern. Soc. 1: 69. 1811.
- 1818 *Forsteronia* G. F. W. Mey. Fl. Esseq. 133. 1818.
- 1819 *Thenardia* HBK. Nov. Gen. 3: 209. 1819.
- 1825 *Haemadictyon* Lindl. Trans. Hort. Soc. Lond. 6: 70. 1825.
- 1828 *Syringosma* Mart. ex Rchb. Consp. 134. 1828.
- 1838 *Exothostemon* G. Don, Gen. Hist. Dichlam. Pl. 4: 82. 1838.
- 1840 *Mandevilla* Lindl. Bot. Reg. N. S. 3: pl. 7. 1840.
- 1841 *Odontadenia* Benth. in Hook. Jour. Bot. 3: 242. 1841.
- Thyrsanthus* Benth. loc. cit. 245. 1841.
- 1844 *Malouetia* A. DC. in DC. Prodr. 8: 378. 1844.
- Anisolobus* A. DC. loc. cit. 395. 1844.
- Robbia* A. DC. loc. cit. 444. 1844.
- Secondatia* A. DC. loc. cit. 445. 1844.
- Lasequea* A. DC. loc. cit. 481. 1844.
- Dipladenia* A. DC. loc. cit. 1844.
- Laubertia* A. DC. loc. cit. 486. 1844.
- 1849 *Cycladenia* Benth. Pl. Hartw. 322. 1849.
- 1855 *Cylcadenia* Lem. Illustr. Hort. 2: Misc. 9. 1855.
- 1860 *Heterothrix* Muell.-Arg. in Martius, Fl. Bras. 6¹: 133. 1860.

¹³ Cf. Stadelm. Flora 24¹: Beibl. 1-13. 1841.

¹⁴ R. Br. Mem. Wern. Soc. 1: 59. 1811.

¹⁵ Ibid. loc. cit. 69. 1811.

- Macrosiphonia* Muell.-Arg. loc. cit. 137. 1860.
Amblyanthera Muell.-Arg. loc. cit. 141. 1860, not
Blume.
Mesechites Muell.-Arg. loc. cit. 150. 1860.
Rhodocalyx Muell.-Arg. loc. cit. 172. 1860.
Rhabdadenia Muell.-Arg. loc. cit. 173. 1860.
Stipecoma Muell.-Arg. loc. cit. 175. 1860.
Elytropus Muell.-Arg. Bot. Zeit. 18: 21. 1860.
Prestoniopsis Muell.-Arg. loc. cit. 22. 1860.
Urechites Muell.-Arg. loc. cit. 22. 1860.
- 1878 *Chariomma* Miers, Apoc. So. Am. 110. 1878.
Eriadenia Miers, loc. cit. 117. 1878.
Aptotheca Miers, loc. cit. 150. 1878.
Rhaptocarpus Miers, loc. cit. 151. 1878.
Micradenia Miers, loc. cit. 158. 1878.
Homaladenia Miers, loc. cit. 163. 1878.
Angadenia Miers, loc. cit. 173. 1878.
Perictenia Miers, loc. cit. 182. 1878.
Tennadenia Miers, loc. cit. 207. 1878.
Mitozus Miers, loc. cit. 217. 1878.
- 1897 *Streptotrachelus* Greenm. Proc. Am. Acad. 32: 298.
1897.
- 1905 *Bracea* Britton, Bull. N. Y. Bot. Gard. 3: 448. 1905,
not King.
- 1909 *Orthechites* Urb. Symb. Ant. 6: 36. 1909.
- 1917 *Belandra* S. F. Blake, Contr. Gray Herb. N. S. 52: 78.
1917.
- 1920 *Neobracea* Britton, in Britton & Millsp. Bahama Fl.
335. 1920.
- 1924 *Codonechites* Mgf. Notizblatt 9: 80. 1924.
- 1927 *Macropharynx* Rusby, Mem. N. Y. Bot. Gard. 7: 327.
1927.
- 1931 *Salpinctes* Woodson, in Gleason, Bull. Torrey Bot. Club
58: 453. 1931.
- 1932 *Allomarkgrafia* Woodson, Ann. Mo. Bot. Gard. 19:
45. 1932.
- Asketanthera* Woodson, loc. cit. 46. 1932.
Fernaldia Woodson, loc. cit. 48. 1932.

Galactophora Woodson, loc. cit. 49. 1932.

Peltastes Woodson, loc. cit. 375. 1932.

An interesting if frequently perplexing feature shared in common by many species of the majority of genera enumerated is their persistent popular association with the parent genus *Echites* within which they were once included. Perhaps the highest attainment of the research upon the Apocynaceae of Alphonse de Candolle and particularly of Mueller-Argoviensis was the distillation of the American representation of the inclusive genus *Echites* into numerous more natural entities. Unfortunately, the painstaking studies of those eminent systematists was discredited to a certain degree by the contemporaneous treatment of John Miers which has discouraged the employment of the valid segregates by confounding with them a miscellaneous assortment of incongruous species and genera.

The revision of the Apocynaceae under the authorship of K. Schumann¹⁶ in Engler & Prantl's 'Natürlichen Pflanzenfamilien' has helped to reclarify the status of the American Echitoideae, but has suffered as a result of the acceptance of Miers's mistaken interpretations in several instances. Schumann unfortunately profited little by the excellent natural order given the genera of the subfamily by Mueller, and as a consequence in his enumeration one finds *Eriadenia* Miers and *Mandevilla* Lindl., considered as synonymous by Markgraf¹⁷ and in the present revision, separated by such discrepant genera as *Macrosiphonia* Muell.-Arg., *Rhodocalyx* Muell.-Arg., *Cycladenia* Benth., *Dipladenia* A. DC., *Odontadenia* Benth., *Elytropus* Muell.-Arg., *Rhabdadenia* Muell.-Arg., and *Laubertia* A. DC., in the order named. This situation is the result of the key characters employed by Schumann, particularly that of gross habit, which not only separate closely related genera but even exclude generically certain species from others which are manifestly their congeners.

MORPHOLOGY OF THE TAXONOMIC CRITERIA

The danger of basing generic distinctions within the Echitooideae upon habit already has been observed. As a group, the

¹⁶ K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 109-189. 1895.

¹⁷ Mgf. Notisblatt 9: 85. 1924.

subfamily is predominantly composed of extensive lianas so characteristic of the tropical American rain-forests. *Forsteronia*, *Prestonia*, *Odontadenia*, and *Echites* (*sensu stricto*) are familiar examples of genera with exclusively volubile habit among all known species. *Necubaea* is fruticose, while *Malouetia* is the only known genus attaining arboreal proportions. The species comprising *Macrosiphonia*, *Salpinctes*, *Galactophora*, and *Rhodocalyx* might with almost equal aplomb be called suffrutescent herbs or subherbaceous undershrubs. *Cycladenia* is unique within the entire family because of its low, subsucculent, herbaceous habit, and its subalpine habitat. Various combinations of habit render that character an extremely fallible guide in particular instances. *Mandevilla* is probably the outstanding example in this regard, including among its many species lianas, suffruticose shrubs, and suffrutescent herbs in a wide range of intergradation.

Although predominantly terete, the stems of certain American Echitoideae display a conspicuous alate development, as in several shrubby species of *Mandevilla* subgen. *Exothostemon* (§ *Eriadenia* Mg.). Such development of the stem appears to be caused by the activity of the phellogen rather than of the vascular cambium, however, and thus bears only a superficial resemblance to the polydesmic stems of certain other tropical lianas.

Phyllotaxy is relatively uniform throughout the subfamily in America, the distichous arrangement being almost invariable. *Mandevilla Benthamii* (A. DC.) K. Sch. constitutes a striking exception in its ternate or quaternate foliage. The leaves of species of *Laubertia* and *Macrosiphonia* are occasionally ternate as well.

The foliar glands of several genera are easy clues for identification. These organs are small, occasionally quite inconspicuous, multicellular, aculeolate emergences borne upon the ventral surface of the midrib. In *Allomarkgrafia*, *Mesechites*, *Macrosiphonia*, and most species of *Forsteronia*, they occur at the base of the midrib in shapes, positions, and numbers generally characteristic of genera or subgenera and to a somewhat less extent of species. In *Allomarkgrafia*, *Macrosiphonia*, and *Forsteronia* the glands are fusiform and indistinctly gathered into groups of few to several. In *Mesechites*, however, the two component sub-

genera are rather nicely distinguishable by means of the glands, those of subgen. *Eumesechites* assuming a rather flat or laminate shape and occurring in groups of two to five clustered concentrically along the base of the midrib, while those of subgen. *Antillechites* are less conspicuous, fusiform bodies which are predominantly found in pairs radially placed at the very base of the midrib.

In *Mandevilla* subgen. *Eumandevilla*, the foliar glands are fusiform and are grouped at the base of the midrib as in *Allo-markgrafia*, but in subgen. *Exothostemon* the same structures occur in variable numbers along the entire length of the rib. Were it not for three common species supplying an indubitable link between the two subgenera, which also have technical differences in the reproductive organs, the characteristic position of the foliar glands of subgen. *Exothostemon* would render it one of the most easily recognized genera of the subfamily. Species of the latter subgenus, however, have long been popularly associated with those of *Eumandevilla*, and in view of this consideration, together with that of the intermediate characteristics of *M. funiformis* (Vell.) K. Sch., *M. callista* Woodson, and *M. congesta* (HBK.) Woodson, it has been thought desirable to maintain their unity for the present.

The Apocynaceae are popularly known as an exstipulate group. However, immediately subtending the petiole of many species of that family, usually forming a definitely interpetiolar girdle when the phyllotaxy is opposite or verticillate, are more or less conspicuous appendages, variously arranged, which should probably be interpreted as stipular vestiges. In the Echitoideae of the western hemisphere, these structures are usually glandular in function, although in *Odontadenia anomala* (Heurck & Muell.-Arg.) Macbr. they are somewhat foliaceous, this departure from the predominant condition prompting Miers to establish for its inclusion the genus *Perictenia*. A third condition of the interpetiolar appendages has been interpreted as aiding the plant in clinging to a support in the case of certain lianas, as *M. Luetzelburgii* (Ross & Mgf.) Woodson, where the structures develop a phellogen and form relatively stout, frequently more or less reflexed hooks or "kletterhaken." Among certain more advanced genera of Echitoideae the stipular appendages occupy an

intrapetiolar position, as in *Thenardia*, *Fernaldia*, and *Prestonia*. These nodal appendages are frequently diagnostic for species or groups of species, particularly in the case of the genus *Mandevilla*, and have the double merit of being quickly perceived and rather convincing accompanying indicators of natural relationship.

Inflorescence structure in the subfamily is varied, but almost universally resolves into modifications of the raceme and the dichasial cyme. The most frequent modification of the raceme is the spike, and occurs among widely separated species of different genera. The cyme, although found in almost perfect form in certain species of *Echites* (*sensu stricto*) and *Cycladenia*, becomes thyrsiform in *Odontadenia* and others, paniculate in *Forsteronia*, and is transformed into umbellate construction in *Thenardia*. The uniflorous condition is gradually approached from both determinate and indeterminate positions, the former being attained in *Rhabdadenia*, *Echites crassipes* A. Rich., and the Antillean species of *Mesechites*, and the latter in *Salpinctes* and the North American species of *Macrosiphonia*.

A highly specialized type of indeterminate inflorescence which appears to furnish a clue to the relationship of determinate and indeterminate structure in the subfamily is the so-called "bostrychoid raceme," in which the pedicels are clustered in pairs, and not alternate as in the true raceme. Genera possessing this form of inflorescence are *Prestonia*, *Urechites*, *Asketanthera*, and *Angadenia*. In *Allomarkgrafia*, *Mesechites*, *Temnadenia*, and certain species of *Prestonia*, a peculiar structure of inflorescence is found in the di- or trichotomy of the primary peduncle. It is supposed that this type may be due either to true dichotomy of the growth initials, or rather to the suppression of the determinate flower in a primitive, dichasial cyme such as that found in several closely related genera.

By far the most important criteria in the delimitation of the genera and species of Echitoideae are found in the floral organs. Although their presence has been known since the time of publication of *Echites* in 1756, and their importance suspected by Robert Brown, the internal, calycine appendages, known as "squamellae," have not received the consideration which is due them as indicators of natural relationship. The squamellae are present in all

genera of the subfamily as represented in America with the exception of *Elytropus*, *Rhabdadenia*, *Cycladenia*, and *Laubertia*. Where present, they have been found to assume a position either alternate with the calyx-lobes, or opposite them, thus coinciding in general with the position of the nodal, or stipular, appendages. When opposite, the squamellae are solitary, although the individuals may be deeply laciniate. When alternate, they have been found to number from one to many, in which case they may be so numerous as to extend in a more or less uniform ring about the base of the corolla-tube, losing the appearance of an alternate arrangement. The close relationship of the strictly alternate and the indefinite positions, however, is attested by their occurrence in adjacent congeners.

When taken in combination with the foliar glands, the construction of the anther furnishes one of the most reliable clues to relationship among the genera. In all genera having glandular foliage, the enlarged peltate connective, which should be remembered as the chief characteristic of both Echitoideae and Apocynoideae, is very bluntly cordate, or truncate, with various modifications. In the genera with eglandular foliage, with the exception of *Fernaldia* and *Asketanthera*, the basal lobes or auricles are more narrow, and usually sharply acute to sub-setaceous. Although the lobing of the connective is similar to that of the former group in *Asketanthera* and *Fernaldia*, the structure of the microsporangia indicates an unmistakable affinity for the latter, being produced into a conspicuous, inwardly protuberant, sterile base. The microsporangia of the former group, on the other hand, are completely and uniformly fertile throughout. Although the major groups of genera enumerated in the appended key are generally divisible upon the structure of the pollen-sac, several modifications occur which render the character difficult to use for practical purposes of identification. Such intergradations are found in genera which fall rather naturally to an intermediate position in the whole group through the use of other key characters.

The importance of the microsporangial structure is reflected in that of the stigma, occasionally referred to in the English literature and in certain studies of this series as the "clavuncle." In those

genera having anthers with truncate or bluntly auriculate connective and uniformly fertile sporangia, as in *Mandevilla*, the stigma is pentagonal-umbraculiform or pentagonal-subglochidiate in shape, except in *Allomarkgrafia* where it is more nearly pentagonal-fusiform. The five ridges of these umbraculiform or subglochidiate structures lie in such a plane that they are appressed to the anther connective immediately below the sporangia and above the insertion of the filament. The papillate surfaces of the stigma lie just at the base of the terminal apices, or "apiculae," and in actual contact with the pollen-sacs.

On the other hand, those genera having anthers with microsporangia produced into an inwardly protuberant, sterile base possess stigmata which are fusiform to subcapitate in shape, as in *Prestonia*. These stigmata usually have a somewhat swollen, sterile tip upon which the sterile base of the pollen-sacs rests. The base of the stigma is frequently elaborated into a membranaceous girdle which is agglutinated to the anther connective just above the insertion of the filament, or such a process may be imitated by an elaboration of the anther connective itself at the place of insertion of the anther. In such stigmata, the papillate or receptive surfaces are median, occupying a space supposedly sheltered from the natural pollen-shed of the same flower. The anthers are so closely cemented into a conical mass about the stigma by means of glandular secretions and the various parts so precisely comprise the whole that the agency of insects in pollination at once suggests itself. At any rate, the structure and relationship of the anthers and stigma, so suggestive of the gynostegium of Asclepiadaceae, when combined with the vegetative characters which have already been stressed, evidently provide a promising clue to generic relationships within the whole subfamily. Diagrams to depict the construction and relation of androecium and gynoecium as described in the paragraphs immediately preceding are provided in text-figure 1.

Surrounding the ovary of all American Echitoideae with the exception of two species of *Mandevilla* § *Montanae* is a cycle of glandular organs roughly simulating the carpels which have been referred to in the English literature and in preceding studies of this series as "nectaries." The same structures have been

called "disc lobes" by Schumann and Markgraf. The nectaries are various in number and constitution. In all species with the exception of those included within the genera *Salpinctes*, *Fernaldia*, and certain others included within *Mandevilla* §§ *Montanae* and *Lazae*, they are five in number, which seems to be basic for the group. In some species these organs may be distinct and

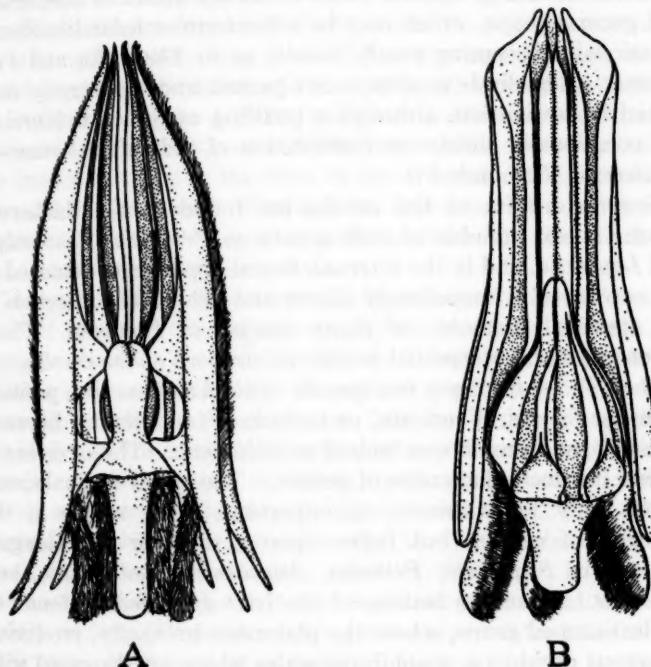


Fig. 1. The relation of stamens and stigma in the Echitoidae. A—*Prestonia trifida* (Poepp.) Woodson, four stamens and stigma; B—*Mandevilla Bridgesii* (Muell.-Arg.) Woodson, three stamens and stigma. Explanation in the text.

separate; in others they may be concrecent and assume a more or less annular condition. The nectaries may vary within a single genus from bodies equalling or somewhat surpassing the carpels to extremely inconspicuous protrusions of the receptacle. The number and condition of the nectaries have been considered of prime importance in previous work undertaking the delimita-

tion of genera within the Echitoideae. Greatly increased material for study has shown the characters of the nectaries to be not so trustworthy as had previously been supposed, however, and in the present revision they are interpreted as specific indicators except in a few peculiar exceptions.

The corolla structure of the subfamily as represented in America presents criteria of specific value in such matters as size, color, and general shape, which may be salverform or infundibuliform, occasionally becoming nearly rotate, as in *Thenardia* and *Forsteronia*. The limb is always five-parted and dextrorsely contorted in aestivation, although a puzzling exception is found in the occasionally sinistrorse convolution of individual flowers of *Forsteronia floribunda* Sw.

Generic criteria of the corolla are found in the thickened, callous faecal annulus of such genera as *Prestonia*, *Rhodocalyx*, and *Laubertia*, and in the internal, faecal appendages attached to the corolla-tube immediately above and behind the insertion of the staminal filaments of many species of *Prestonia*. These appendages are interpreted merely as enations of the corolla.

The follicles display a few specific criteria such as size, position (whether falcate, divaricate, or tortuous), constrictions between the seeds, and presence or lack of an indument. The seeds are in several instances diagnostic of genera. The apical seminal coma, absent only in *Malouetia*, is important, being sessile in the majority of genera, but borne upon a more or less elongate rostrum in *Stipecoma*, *Peltastes*, *Angadenia*, *Rhabdadenia*, and *Urechites*. A unique feature of the fruit and seeds is found in the last-named genus, where the placentae are chaffy, producing numerous deciduous, scaphiform scales which are dispersed with the seeds, which they roughly simulate, in large numbers upon dehiscence of the follicle. This character is perhaps the most striking of any similar features in the entire family.

GEOGRAPHICAL DISTRIBUTION

The geographical distribution of the genera which are included within this study may be rather succinctly expressed since, with the exception of one only, all are confined to the western hemisphere. For the barest purposes of convenience, the genera

which are strictly American may be divided into three main groups composed of those represented upon both the continental mass proper and the islands of the Antilles, those limited to the continent, and those confined to the Antilles. These groups may be amplified and in turn subdivided as follows:

Genera common to both the continent and the Antilles.—Within this group, which comprehends all the larger genera and about two-thirds the total species of the American representation of the subfamily Echitoideae, two subdivisions may be recognized, namely, genera containing at least one species common to both the continent and the Antilles, and those containing one or more endemic Antillean congeners. The first subdivision accentuates the familiar affinity of the flora of the Greater Antilles for that of southern peninsular Florida, the Bahama Islands, certain districts of Central America, and localities of the northern Atlantic coast of South America.

The genus *Echites* (*sensu stricto*) is perhaps the most familiar echitoid liana of the region roughly cited above through its representation by *E. umbellata* Jacq., a frequent inhabitant of swamps and coastal thickets of southern peninsular Florida and its adjacent keys, the Bahama Islands, Cuba, Hispaniola, Jamaica, and the coastal flats of northern Yucatan and British Honduras. *E. crassipes* A. Rich., perhaps better treated as merely a variety of the preceding, is confined to Cuba. Three species of *Echites* also occur locally in Guatemala, Yucatan, Costa Rica, and the Mexican state of Chiapas. It may be mentioned incidentally that the Antillean-continental and the strictly continental species of this genus are separable as sectional units upon morphological grounds.

The range of the genus *Rhabdadenia* is somewhat similar in its Antillean relations to that of *Echites*, since *Rh. biflora* (Jacq.) Muell.-Arg. occurs throughout practically the same territory as does *E. umbellata* Jacq., with the addition of Porto Rico, the French West Indies, and local districts of Atlantic coastal Colombia and British Honduras. The species has also been reported from the coastal swamps of Venezuela, the Guianas, and northern Brazil. Two other species of *Rhabdadenia* occur upon the eastern slope of South America from Colombia to Paraguay.

Vying with the wide distribution of the Antillean species of the two genera immediately preceding, *Urechites lutea* (L.) Britton constitutes a familiar component of coastal thickets in southern peninsular Florida, the Bahama Islands, Cuba, Hispaniola, Jamaica, Porto Rico, the Virgin Islands, and the islands of the Lesser Antilles belonging to France and Great Britain (with the exception of Trinidad). The species has been reported also from British Honduras. Another species of *Urechites* is confined to northern Central America.

The combination of continental and Antillean distribution is exemplified somewhat less vividly by the genera *Forsteronia* (with *F. spicata* (Jacq.) G. F. W. Meyer common to Cuba and localities in northern Central America and Atlantic coastal Colombia, and numerous species confined to Central and South America), and *Mandevilla* (with *M. torosa* (Jacq.) Woodson common to Jamaica and northern Yucatan, and many species confined to the continental mass south of the Tropic of Cancer). The situation of *Angadenia*, with one species, *A. Sagraei* (A. DC.) Miers, common to southern peninsular Florida, the Bahama Islands, and Cuba, and an endemic Cuban species, might more appropriately be noted among the strictly Antillean genera, since the Apocynaceae of peninsular Florida are wholly Antillean in their affinities.

The second subdivision, composed of genera possessing endemic Antillean species, is exemplified by *Prestonia*, *Secondatia*, and *Odontadenia*, the first with two, and the remainder with a single Antillean species of rather limited distribution in addition to numerous strictly continental congeners. *Forsteronia* deserves comment in this group, as it includes two endemic Antillean species, *F. corymbosa* (Jacq.) G. F. W. Mey. and *F. floribunda* Sw., in addition to the Antillean-continental *F. spicata* (Jacq.) G. F. W. Mey. The genus *Mesechites* is particularly noteworthy in this instance, since it is composed of two subgenera limited to the Antillean islands of Cuba and Hispaniola and to the mainland south of Mexico; containing four and six well-defined species respectively.

Genera limited to the continent.—The genera of this group are more numerous, but are monotypic in several instances and thus include fewer species than those of the first category. A relatively

limited distribution is typical of these genera, with three exceptions which will be noted separately. For the sake of convenience, the genera of limited distribution may be epitomized as follows:

1. Endemic genus of the Pacific coastal region of the United States: *Cycladenia*, with one species of California and southern Utah.
2. Endemic genera of southern Mexico and Central America: *Thenardia* and *Fernaldia*.
3. Endemic genera of the upper Amazon valley: *Allomarkgrafia* and *Macropharynx*, the latter monotypic.
4. Endemic genera of northern Brazil and adjacent Venezuela and British Guiana: *Salpinctes* and *Galactophora*.
5. Endemic genera of southeastern Brazil: *Stipecoma*, *Temandenia*, and *Rhodocalyx*, the first and last monotypic.
6. Endemic genus of Chile: the monotypic *Elytropus*, which is the sole representative of the subfamily in that country.

Beside the twelve genera enumerated immediately above, three others occur with somewhat more complicated distribution: *Laubertia*, with one species in southern Mexico, one in northern Colombia, and one in northeastern Peru; *Peltastes*, with two species in southeastern Brazil, and one species each in northern Paraguay, eastern Bolivia, and northern Colombia; and *Macrosiphonia*, with five species of southeastern Brazil and adjacent Paraguay, Uruguay, and Argentina, and five species of the southwestern United States and adjacent Mexico.

Genera limited to the Antilles.—Only two genera comprise this group, namely, *Neobracea*, with one endemic species of the Bahama Islands, and three of Cuba, and *Asketanthera*, with two endemic species each of Cuba and Hispaniola respectively.

The American genera of Echitoideae predominantly inhabit the tropical and subtropical rain-forests at altitudes of from near sea-level to about 1500 m. elevation, frequently spreading into well-watered thickets as well. Species of such habitats are usually lianas or straggling shrubs bearing large, membranaceous, relatively distant leaves. The unique growth conditions of the plains or "campos" of southeastern South America, on the other hand, evidently stimulate the growth of erect, suffruticose or suffrutescent species characterized by more crowded, smaller,

frequently coriaceous or subcoriaceous foliage. Similar habitat modifications are found among species of the plains and plateaus of northern Brazil and adjacent Venezuela and British Guiana. Among such species a striking tendency toward the reduction of the inflorescence manifests itself.

Other characteristic habitats frequented by certain genera and species of the subfamily in the western hemisphere are brackish swamps and coastal thickets. The subalpine distribution is represented by a single genus of small, semi-succulent, perennial herbs frequenting altitudes of approximately 1500–3500 m. in the Pacific southwestern United States. A rough outline of the chief types of habitat and their predominant Echitoideae may be provided as follows:

Rain-forests and thickets (frequently riparian): *Allomarkgrafia*, *Asketanthera*, *Fernaldia*, *Forsteronia*, *Laubertia*, *Macrophyrynx*, *Malouetia*, *Mandevilla*, *Mesechites*, *Odontadenia*, *Peltastes*, *Prestonia*, *Secondatia*, *Stipecoma*, *Ternadenia*, *Thenardia*, *Trachelospermum*.

Coastal swamps: *Echites*, *Malouetia* spp., *Mesechites* spp., *Rhabdadenia*, *Trachelospermum*.

Coastal thickets (not swampy, typically arenaceous): *Angadenia*, *Echites* spp., *Neobracea*, *Rhabdadenia* spp., *Urechites*.

Plains and plateaus: *Elytropus*, *Galactophora*, *Macrosiphonia*, *Mandevilla* spp., *Rhabdadenia* spp., *Rhodocalyx*, *Salpinctes*.

Subalpine: *Cycladenia*.

RELATIONSHIP OF OLD AND NEW WORLD GENERA

The problem of the relationship of the American genera of Echitoideae to those of the Old World is a relatively simple one, as has already been implied, since of the total only one is indigenous to both hemispheres. The generic affinity of *Echites difformis* Walt. has been a moot question almost since its publication, having been included more or less intermittently within the genera *Echites*, *Forsteronia*, and *Secondatia* by successive authors. In 1878 the species attracted the attention of Dr. Asa Gray, probably as a result of his classical studies of the affinity of the flora of the southeastern United States for that of eastern Asia, who removed it to the Asiatic genus *Trachelospermum*. As a

matter of fact, the distribution of *T. difforme* along the southern Atlantic coastal plain of North America from southern Delaware to Georgia, thence to eastern Texas and up the lowlands of the former Mississippi embayment to southern Missouri, Illinois, and Indiana, appears strongly indicative of eastern Asiatic affinities, and presents a striking parallel with that of *Taxodium distichum*, a species of great antiquity, with which it is often associated.

With the factor of geographical distribution deleted, the reasons for placing *T. difforme* within *Trachelospermum* are rather extenuated, resting almost solely upon the basis of the geminate calycine squamellae and subcapitate stigma. In all species of *Secondatia* known at the present time the squamellae are solitary and alternate with the calyx-lobes, and the stigma is narrowly fusiform. These rather inconsequential characters would appear to be the only evident distinctions of the two genera, and one is confronted with the dilemma whether to merge the two in the interests of natural classification or to maintain them separate upon whatever slight if constant criteria for the sake of convenience and constancy.

The most apparent connecting-link between the Echitoideae of the Old World and the New, then, is provided in the rather obscure relationship of the Asiatic-southeastern North American genus *Trachelospermum*, and the South American-Antillean *Secondatia*. A second example of affinity is afforded by the Asiatic-Oceanic genus *Parsonsia* and the South and Central American-Antillean genus *Forsteronia*, of which the degree of syncarpy or apocarpy would appear to be the chief distinguishing characters. A third line of relationship between the Apocynaceous flora of the two hemispheres, involving the Asiatic-African genera *Kibatalia* and *Funtumia*, and the American genera *Malcuetia* and *Forsteronia*, will be treated in a subsequent discussion. With the exception of the genera mentioned, the distinction of the Echitoideae of the two hemispheres is impressive.

Although several species of the Old World Echitoideae are cultivated in America, and in the warmer latitudes tend to escape and naturalize, these are usually so well known that it has been decided to exclude them from the present account, limiting it to those strictly indigenous to the western hemisphere.

KEY TO THE AMERICAN GENERA OF ECHITOIDEAE

- A. Anthers with thick obtuse basal auricles, or truncate; stigma pentagonal-umbraculiform or subglochidiate (except in *Allomarkgrafia*); upper surface of leaves glandular upon the midrib (except in certain species of *Mandevilla*).
 B. Inflorescence bostrychoid, di- or trichotomously compound.
 C. Corolla infundibuliform; stigma fusiform.....I. ALLOMARKGRAFIA
 CC. Corolla salverform; stigma umbraculiform.....II. MESECHITES
 BB. Inflorescence not bostrychoid, simple (or very rarely obscurely paniculate in certain species of *Mandevilla*).
 C. Flowers hemeranthous; stigma umbraculiform; lianas, or infrequently suffrutescent herbs.....III. MANDEVILLA
 CC. Flowers nyctanthous or vespertine; stigma subglochidiate,* suffrutescent herbs.....IV. MACROSIPHONIA
 AA. Anthers with slender or attenuate basal auricles (except in *Askelanthera*, *Fernaldia* and *Echites elegantula*); stigma fusiform to subcapitate; leaves eglandular (except in certain species of *Forsteronia*).
 B. Squamellae predominantly more numerous than the calyx-lobes, and alternate with them, indefinitely and uniformly distributed, or obsolete; corolla not provided with a callous faecal annulus.
 C. Squamellae present.
 D. Seminal coma sessile or absent.
 E. Nectaries 5, separate or more or less concrecent.
 F. Corolla salverform, relatively small.
 G. Inflorescence thyrsiform; seeds apically comose; lianas.
 H. Anthers exserted, at least the tips; leaves glandular in most species.....V. FORSTERONIA
 HH. Anthers wholly included; leaves not glandular.
 I. Squamellae solitary; stigma narrowly fusiform.VI. SECONDATIA
 II. Squamellae geminate; stigma subcapitate.....VII. TRACHELOPERMUM
 GG. Inflorescence umbellate; seeds without an apical coma; shrubs or small trees.....VIII. MALOUETIA
 FF. Corolla infundibuliform, or large and showy if salverform.
 G. Calyx-lobes closely imbricated at anthesis; lianas.....IX. ODONTADENIA
 GG. Calyx-lobes not imbricated at anthesis, or scarcely so; shrubs and suffrutescent herbs.
 H. Flowers relatively small; squamellae in groups alternate with the calyx-lobes; anthers pubescent dorsally; shrubs.....X. NEOBRACEA
 HH. Flowers large and showy; squamellae indefinitely distributed; anthers glabrous; suffrutescent herbs....XI. GALACTOPHORA
 EE. Nectaries 2, separate.....XII. SALPINCTES
 DD. Seminal coma rostrate.
 E. Leaves peltate.

*Character suggested by Dr. Fr. Markgraf, Berlin-Dahlem.

- F. Corolla infundibuliform; calyx-lobes foliaceous; squamellae indefinitely distributed..... XIII. PELTASTES
- FF. Corolla salverform; calyx-lobes scarious; squamellae in groups alternate with the calyx-lobes..... XIV. STIPECOMA
- EE. Leaves not peltate.
 - F. Anthers without linear apical appendages; placentae not chaffy..... XV. ANGADENIA
 - FF. Anthers with linear apical appendages; placentae chaffy in fruit..... XVI. URECHITES
- CC. Squamellae obsolete.
 - D. Shrubs and lianas; nectaries separate or essentially so.
 - E. Flowers large and showy; seminal coma rostrate. XVII. RHABDADENIA
 - EE. Flowers relatively small; seminal coma sessile. XVIII. ELYTROPUS
 - DD. Semi-succulent perennial herbs; nectaries concrescent..... XIX. CYCLADENIA
 - BB. Squamellae as numerous as the calyx-lobes, and opposite them, occasionally deeply lacerate, or if obsolete the corolla provided with a callous faecal annulus.
 - C. Orifice of the corolla not annulate; anthers wholly included (except in *Thenardia*).
 - D. Corolla infundibuliform or salverform; anthers wholly included.
 - E. Inflorescence determinate..... XX. ECHITES
 - EE. Inflorescence indeterminate.
 - F. Inflorescence di- or trichotomously compound. XXI. TEMNADENIA
 - FF. Inflorescence simple.
 - G. Calyx 5-parted; pedicels subtended by solitary bracts.
 - H. Calyx-lobes and bracts scarious; corolla infundibuliform, villous within, at least the lobes..... XXII. FERNALDIA
 - HH. Calyx-lobes and bracts foliaceous; corolla salverform, glabrous within..... XXIII. ASKETANTHERA
 - GG. Calyx 7-9-parted, immediately subtended by many bracts..... XXIV. MACROPHARYNX
 - DD. Corolla rotate (or rarely subsalverform); anthers exserted..... XXV. THENARDIA
 - CC. Orifice of the corolla annulate; anthers exserted (except in certain species of *Prestonia*).
 - D. Squamellae present.
 - E. Lianas; inflorescence lateral, rarely subterminal; petioles subtended by few to several pectinate glands; corolla usually with 5 internal faecal appendages..... XXVI. PRESTONIA
 - EE. Suffrutescent herbs; inflorescence terminal; petioles not glandular; corolla exappendiculate within.... XXVII. RHODOCALYX
 - DD. Squamellae obsolete..... XXVIII. LAUBERTIA

I. ALLOMARKGRAFIA Woodson

Allomarkgrafia Woodson, Ann. Mo. Bot. Gard. 19: 45. 1932.
 Lactescent, suffruticose lianas. Stems volubile, terete; branches opposite below, becoming alternate above. Leaves

opposite, the ventral surface bearing several inconspicuous, glandular emergences indefinitely clustered at the base of the midrib; petioles somewhat girdling at the node into a slightly dilated, minutely appendiculate, stipular ring. Inflorescence lateral, alternate, bostrychoidally racemose, the peduncle regularly and divaricately di- or trichotomously divided, the pedicels opposite, subtended by solitary bracts. Calyx 5-parted, the lobes subequal, imbricated, cleft nearly to the receptacle, bearing within many uniformly distributed, glandular squamellae. Corolla infundibuliform, the tube straight, narrowly cylindrical below, abruptly dilated into the broad, campanulate throat at the insertion of the stamens, the limb 5-parted, actinomorphic, dextrorsely convolute. Stamens 5, inserted at the base of the corolla-throat, wholly included; anthers connivent and agglutinated to the stigma, consisting of 2 parallel, uniformly fertile sporangia borne ventrally near the apex of an enlarged, sagittate, obtusely 2-auriculate, peltate connective; pollen granular; filament short, subcylindrical, retrorsely pilose. Carpels 2, united at the apex by an elongate stylar shaft surmounted by the fusiform stigma; ovules many, several-seriate, borne upon an axile, binate placenta. Nectaries 5, separate or somewhat concrecent at the base. Follicles 2, apocarpous, terete, acuminate, dehiscing along the ventral suture, containing many dry, subscaphiform, truncate, apically comose seeds.

Type species: *Allomarkgrafia ovalis* (Mgf.) Woodson, Ann. Mo. Bot. Gard. 19: 45. 1932.

KEY TO THE SPECIES

- a. Inflorescence relatively sparse and lax; corolla 4-6 cm. long; squamellae narrowly ligular; nectaries shorter than the ovary; plants of north-eastern Peru..... 1. *A. ovalis*
- aa. Inflorescence relatively dense and congested; corolla 3-3.5 cm. long; squamellae subquadrate; nectaries longer than the ovary; plants of north-eastern Colombia..... 2. *A. plumeriaeiflora*

1. *Allomarkgrafia ovalis* (Mgf.) Woodson, Ann. Mo. Bot. Gard. 19: 45. 1932.

Echites ovalis Mgf. Notizblatt 9: 79. 1924.

Echites ovalis Tafalla, ex Mgf. loc. cit. 1924, nom. nud. in synon.

Plate 1.

Glabrous, suffruticose lianas; stems relatively stout, terete; leaves narrowly oblong-elliptic, apex abruptly acute-subcaudate, base obtuse or rounded, 10–15 cm. long, 3.5–5.0 cm. broad, coriaceous, glabrous; petiole 1.0–1.25 cm. long; inflorescence somewhat shorter than the subtending leaves, bearing 15–20 greenish- or yellowish-white flowers; pedicels 2.0–2.5 cm. long, the subtending bracts minute, scarious; calyx-lobes ovate-oblong, obtuse or broadly acute, 0.3–0.4 cm. long, scarious, glabrous, bearing within numerous, narrowly ligular squamellae; corolla infundibuliform, glabrous without, the proper-tube 1.5–2.0 cm. long, about 0.3 cm. in diameter at the base, the throat campanulate, 1.5–2.5 cm. long, about 1 cm. in diameter at the orifice, the lobes obliquely obovate-reniform, 1.0–1.5 cm. long, widely spreading; anthers narrowly oblong-sagittate, 0.5–0.6 cm. long, glabrous; ovary oblong-ovoid, 0.3–0.4 cm. long, glabrous; stigma 0.3–0.5 cm. long; nectaries oblong-ovoid, about 0.2 cm. long; mature follicles unknown.

PERU: LORETO: Berge südl. Moyobamba in straucharmen Wald, alt. 900–1000 m., Sept. 4, 1904, Weberbauer 4688 (B, MBG, photograph and analytical drawings); Laguna, alt. 600 m., date lacking, Werckle 69 (B); Chicoplaya, 1799, Tafalla s. n. (B, TYPE); Manfinsa, on the upper Rio Nanay, June–July, 1929, Williams 1133 (FM).

2. *Allomarkgrafia plumeriaeflora* Woodson, spec. nov., suf-fruticosa volubilis ut dicitur ca. 25–35 m. altitudine pertinens; ramulis teretibus vel leviter subcompressis glabris cortice virido-brunneis maturitate dense lenticellatis; foliis oppositis petiolatis oblongo-ellipticis breviter acuminatis basi obtusis rotundatisve 14–16 cm. longis 5.0–5.5 cm. latis coriaceis nervo medio supra indistincte multiglanduligero caeterumque glabris; petiolis 1.5–1.7 cm. longis; inflorescentiis terminalibus plurifloris congestis; pedunculo petiolos subaequante; pedicellis 0.7–0.8 cm. longis post maturitatem paullulo accrescentibus; calycis laciniis late ovatis obtusis 0.3–0.4 cm. longis scariaceis glabris intus basi 2-glanduligeris; corollae infundibuliformis dilute givvae extus glabrae tubo proprio 1.0–1.2 cm. longo basi ca. 0.25 cm. diametro metiente paulo supra basem aliquid dilatato deinde apicem versus gradatim attenuato ibique staminigero faucibus late conico-

campanulatis 0.7 cm. longis ca. 0.7 cm. diametro metientibus lobis late dolabriformibus obtusis 1.5 cm. longis patulis; antheris oblongo-oblanceolatis obtuse auriculatis 0.5 cm. longis glabris; ovario oblongoideo ca. 0.3 cm. longo glabro; stigmate fusiformi basi maniculato 0.275-0.3 cm. longo; nectariis anguste oblongoideo-fusiformibus 0.4 cm. longis; folliculis desiderantibus.

Glabrous, suffruticose lianas said to attain a height of 25-35 m.; stems terete or slightly compressed, glabrous, abundantly lenticellate when fully mature; leaves oblong-elliptic, apex shortly acuminate, base obtuse or rounded, 14-16 cm. long, 5.0-5.5 cm. broad, coriaceous, glabrous; petiole 1.5-1.7 cm. long; inflorescence much shorter than the subtending leaves, the peduncle about as long as the subtending petioles, bearing numerous, showy, cream-colored flowers; pedicels 0.7-0.8 cm. long, the subtending bracts ovate, acuminate, 0.2-0.3 cm. long, scarios, persistent; calyx-lobes broadly ovate, obtuse, 0.3-0.4 cm. long, scarios, glabrous, bearing within 2 subquadrate squamellae; corolla infundibuliform, glabrous without, the proper-tube 1.0-1.2 cm. long, about 0.25 cm. in diameter at the base, somewhat dilated toward the middle, thence gradually attenuate to the insertion of the stamens, the throat broadly conical-campanulate, 0.7 cm. long, about 0.7 cm. in diameter at the orifice, the lobes broadly dolabriform, obtuse, 1.5 cm. long, spreading; anthers oblong-oblanceolate, 0.5 cm. long, glabrous; ovary oblongoid, about 0.3 cm. long, glabrous; stigma 0.275-0.3 cm. long; nectaries narrowly oblongoid-fusiform, 0.4 cm. long; follicles unknown.

COLOMBIA: BOYACA: forest's edge at stream side, El Umbo, alt. 3200 ft., Oct. 13, 1932, Lawrance 534 (MBG, TYPE).

Arriving as this paper goes to press, *A. plumeriaeflora* must be included not only as an additional species of a previously monotypic genus, but because it is a novelty from a poorly understood region of great botanical interest. The relationships of this species to *A. ovalis* of northeastern Peru are outlined in the key. Mr. Lawrance has also collected from the region of El Umbo a new species of *Mandevilla*, intermediate between the subgen. *Eumandevilla* and *Exothostemon*, which is described in a subsequent paragraph.

II. MESECHITES Muell.-Arg.

Mesechites Muell.-Arg. in Mart. Fl. Bras. 6¹: 150. 1860; Miers, Apoc. So. Am. 229. 1878, in part, as to subgen. *Didymadenia*.

Echites of many authors, in part, not P. Br.

Lactescent, suffruticose or suffrutescent lianas. Stems voluminous, terete; branches opposite below, becoming alternate above. Leaves opposite, the ventral surface bearing 1–4 inconspicuous, glandular emergences clustered at the base of the midrib; petioles somewhat girdling at the node into a slightly dilated, minutely appendiculate or occasionally exappendiculate, stipular ring. Inflorescence lateral, alternate, bostrychoidally racemose, the peduncle rather irregularly di- or trichotomously divided, the pedicels indefinitely congested, subtended by solitary bracts. Calyx 5-parted, the lobes subequal, imbricated, cleft nearly to the receptacle, bearing within several alternate or indefinitely distributed squamellae. Corolla salverform, the tube straight, slightly dilated at the insertion of the stamens, the limb 5-parted, actinomorphic, dextrorsely convolute. Stamens 5, inserted about midway or somewhat above within the corolla-tube, wholly included; anthers connivent and agglutinated to the stigma, consisting of 2 parallel, uniformly fertile sporangia borne ventrally near the apex of an enlarged, sagittate, obtusely 2-auriculate, peltate connective; pollen granular; filament short, subcylindrical, minutely pilose. Carpels 2, united at the apex by an elongate, stylar shaft surmounted by the umbraculiform stigma; ovules many, several-seriate, borne upon an axile, binate placenta. Nectaries 5, separate or somewhat concrescent at the base. Follicles 2, apocarpous, terete, dehiscing along the ventral suture, containing many dry, subscaphiform, truncate, apically comose seeds.

Type species: *Mesechites Mansoana* (A. DC.) Woodson, Ann. Mo. Bot. Gard. 20: 636. 1933.

KEY TO THE SUBGENERA

- a. Corolla greenish-white flushed with red or purple, occasionally yellowish; foliar glands 1–4, laminate or irregularly pectinate, clustered concentrically; species of Central and South America (including Trinidad and Tobago)..... Subgen. I. EUMESECHITES
- aa. Corolla cream-colored or pink; foliar glands 2, fusiform, clustered radially; species of Cuba and Hispaniola..... Subgen. II. DIDYMADENIA

Subgen. I. EUMESECHITES Woodson, n. subgen.

Corolla greenish-white flushed with red or purple, or yellowish; foliar glands 1–4, laminate or irregularly pectinate, clustered concentrically; suffruticose lianas of Central and South America, including Trinidad and Tobago. *Spp. 1–6.*

KEY TO THE SPECIES

- a. Leaves firmly membranaceous or chartaceous.
- b. Corolla-lobes about half as long as the tube; species of Central and northern South America.
 - c. Plants glabrous; corolla-tube 1.5–2.5 cm. long.....1. *M. trifida*
 - cc. Plants densely puberulent to glabrate; corolla-tube about 1.0–1.25 cm. long.....2. *M. bicorniculata*
- bb. Corolla-lobes $\frac{1}{4}$ – $\frac{1}{3}$ as long as the tube; plants of Paraguay.....3. *M. Sanctae-Crucis*
- aa. Leaves coriaceous.
 - b. Calyx-lobes broadly acute to rounded; species of Peru, Bolivia, and south-central Brazil.
 - c. Plants minutely and irregularly puberulent; leaves broadly and rather obscurely cordate; plants of Peru and Bolivia.....4. *M. acuminata*
 - cc. Plants glabrous; leaves not cordate; plants of south-central Brazil and adjacent Bolivia.....5. *M. Mansoana*
 - bb. Calyx-lobes long-acuminate or subsetose; plants of Colombia.....6. *M. citrifolia*

1. *Mesechites trifida* (Jacq.) Muell.-Arg. in Mart. Fl. Bras. 6¹: 151. 1860.

Echites trifida Jacq. Enum. Syst. Pl. Carib. 13. 1760; Select. Stirp. Am. Hist. 1: 31; 2: pl. 24. 1763; L. Sp. Pl. ed. 2. 307. 1762; A. DC. in DC. Prodr. 8: 454. 1844; Miers, Apoc. So. Am. 202. 1878.

Echites japurensis Stadelm. Flora 24¹: Beibl. 19. 1841; A. DC. loc. cit. 454. 1844; Miers, loc. cit. 205. 1878.

Echites tubulosa Benth. in Hook. Jour. Bot. 3: 249. 1841; A. DC. loc. cit. 1844; Miers, loc. cit. 202. 1878.

Echites surinamensis Miq. Stirp. Surinam. 155. 1850; Miers, loc. cit. 203. 1878.

Echites disadena Miq. loc. cit. 156. 1850; Miers, loc. cit. 204. 1878.

Echites cuspidata Willd. ex Muell.-Arg. loc. cit. 152. 1860, nom. nud. in synon.

Mesechites japurensis (Stadelm.) Muell.-Arg. loc. cit. 152. 1860.

Mesechites surinamensis (Miq.) Muell.-Arg. *Linnaea* 30: 454. 1860.

Mesechites disadena (Miq.) Muell.-Arg. loc. cit. 1860.

Echites pallida Miers, loc. cit. 195. 1878.

Echites trifida Griseb. ex Miers, loc. cit. 202. 1878, sphalm in synon.

Echites rigida Rusby, Mem. N. Y. Bot. Gard. 7: 325. 1927.

Glabrous or essentially glabrous, suffruticose lianas; stems relatively stout; leaves ovate to ovate-oblong, occasionally oblong-lanceolate, apex rather abruptly acuminate to obtuse, mucronulate, base obtuse or rounded, usually more or less cordate, 5–12 cm. long, 2–8 cm. broad, firmly membranaceous, glabrous; petiole 0.5–3.0 cm. long; nodal appendages mostly geminate, rarely obsolete; inflorescence about half as long as the subtending leaves, conspicuously compound, the floriferous branches about as long as the sterile, primary peduncle, bearing 10–25 greenish-white, red- or purple-flushed flowers; pedicels 0.5–1.0 cm. long, the subtending bracts minutely ovate, scarious; calyx-lobes broadly oblong, obtuse or rounded, 0.3–0.5 cm. long, glabrous without or the margins minutely ciliolate; corolla salverform, the tube 1.5–2.5 cm. long, about 0.15 cm. in diameter at the base, somewhat enlarged at the insertion of the stamens, the lobes obliquely obovate-oblong, 0.75–1.5 cm. long, sharply reflexed; anthers 0.4–0.6 cm. long; ovary oblong-ovoid, about 0.2 cm. long, glabrous; stigma 0.2–0.25 cm. long; nectaries compressed-ovoid, about half as long as the ovary; follicles 15–40 cm. long, continuous or essentially so; seeds about 0.75 cm. long, the tawny coma 1.5–2.0 cm. long.

BRITISH HONDURAS: Stann Creek, Dec. 9, 1931, Schipp S47 (MBG).

HONDURAS: ATLANTIDA: wet thicket, vicinity of Tela, at sea-level, Dec. 14, 1927–March 15, 1928, Standley 59619 (FM).

GUATEMALA: ALTA VERAPAZ: Cubilquitz, alt. 350 m., Febr., 1904, Tuerckheim 8540 (G, US); Finca Mocca, alt. 1400 ft., Dec. 4, 1919, Johnson 88 (NY); SANTA ROSA: Jumaytepeque, alt. 6000 pp., Aug., 1892, Heyde & Luz 3994 (G, K, US).

COSTA RICA: GUANACASTE: buissons à Nicoya, Jan., 1900, Tondus 15686 (B, BM, G, K); PUNTARENAS: forets à Boruca, Sept., 1891, Pittier 4417 (Bx, US); près du Desmonte, route de Puntarenas, alt. 500 m., Sept. 17, 1888, Pittier 471 (Bx); CARTAGO: haies à Turrialba, Nov., 1893, Tondus 8322 (Bx); DATA INCOMPLETE: Ørsted 15548 (C).

PANAMA: COCLE: Aguadulce, in savannas near sea-level, Dec. 3–5, 1911, Pittier 4941 (US); PANAMA: in thickets, between Las Sabanas and Matias Hernandez, Jan.

21, 1924, Standley 31810 (US); moist thicket, Juan Diaz, Jan. 11, 1924, Standley 30562 (US); brushy slope, Taboga Island, Dec., 1923, Standley 27986 (US); moist thicket, vicinity of Juan Franco Race-track, Dec. 21, 1923, Standley 27717 (US); more or less forested slopes, in sun, Taboga Island, Febr. 26-27, 1923, Macbride 2777 (FM); Agricultural Experiment Station, Matias Hernandez, Nov. 20, 1914, Pittier 6869 (US); prope urbem Panama, date lacking, Seemann 156, 161 (K); color: brushy slope between France Field, C. Z., and Catiaval, Jan. 9, 1924, Standley 30290 (US); CANAL ZONE: moist woods, Balboa, Nov., 1923-Jan., 1924, Standley 29251 (US); Rio Agua Salud, near Frijoles, March 6, 1923, Piper 5850 (US, S); open bank, climbing on shrubs, near Ft. Randolph, May 26, 1923, Maxon & Harvey 6507 (US); Gatun Sta., Febr. 12, 1860, Hayes 148 (NY).

COLOMBIA: BOLIVAR: river bank, Los Hurtados, on Rio Sinu, alt. 40-70 m., Febr. 4, 1918, Pennell 4155 (NY); low thicket, Bodega Central, along Rio Magdalena, alt. 70 m., Sept. 29, 1922, Pennell 12008 (NY); thicket, Hacienda de Coloncito, near Turbaco, alt. 200-300 m., Nov. 9, 1926, Killip & Smith 14370 (US); river flat, Boca Tai, on Rio Sinu, alt. 50-80 m., Febr. 8, 1918, Pennell 4181 (NY); clearing on river bank, Boca Tai, on Rio Sinu, March 7, 1918, Pennell 4617 (NY); MAGDALENA: Santa Marta, alt. 2000 ft., Dec., 1898, Smith 1641 (Bx, FM, G, MBG, NY, S, US); vicinity of Santa Marta, alt. 150 ft., Aug., year lacking, Smith 1642 (B, BM, FM, G, K, MBG); Santa Marta, 1845, Purdie s. n. (K); ANTIOQUIA: Armenia, vicinity of Medellin, Sept. 15, 1927, Toro 650 (NY); thickets below Santa Barbara, alt. 900-1500 m., Sept. 21, 1922, Pennell 10884 (NY); SANTANDER DEL NORTE: Ocaña, Nov. 19, 1877, Kalbreyer 261 (B); TOLIMA: Rio Paz, alt. 1000-1300 m., March, year lacking, Lehmann 5645 (B, K); META: trail in thicket, Villavicencio, alt. 500 m., Aug. 26-31, 1917, Pennell 1585 (NY).

ECUADOR: GUAYAS: Panigon Plantation, 8 mi. south of Milagro, alt. 50 m., July 11-13, 1923, Hitchcock 20595 (G, NY, US); Milagro, alt. 50 m., June 30-July 2, 1923, Hitchcock 20258 (G, US); ad fl. Daule prope Guayaquil, Sept., 1861, Spruce 6485 (B, BB, K); Rio Chimbo, date lacking, Rimbach 22 (B).

VENEZUELA: MERIDA: Tovar, 1854-55, Fendler 1031 (BB, G, K, MBG, NY); entre La Vega y San Juan, Valle de Chama, Jan. 29, 1928, Pittier 12759 (FM, MBG, MC, NY); CARABOBO: Cumbre, May, year lacking, Linden 580 (BB); Las Trincheras, Oct. 30, 1917, Pittier 7638 (MC); same locality, 1891-92, Warming 252 (C); LARA: Rio Turbio, cerca de Barquisimeto, June 13, 1925, Saer 239 (MC); TRUJILLO: subida del puente de Motatan a Carvajal cerca de Valera, Nov. 21, 1922, Pittier 10760 (MC); cerca de Cuchilla, en matorrales, Jan. 9, 1929, Pittier 13121 (MC); YARACUY: Cayure, Sept. 24, 1923, Pittier 11212 (MC); PORTUGUESA: exact locality lacking, Dec. 28, 1925, Pittier 12037 (MC); DISTRITO FEDERAL: alrededores del Valle, cerca de Caracas, Aug. 28, 1921, Pittier 9730 (MC); Caracas, 1824, Vargas s. n. (DC); AMAZONAS: Taramata, Rio Orinoco, alt. 100 m., Jan. 12-24, 1930, Holt & Gehrig 269 (MBG, MC, US).

TRINIDAD: hillside, Saline Bay, March 9, 1920, Britton 460 (NY); exact locality lacking, 1876, Sieber 373 (DC, DL, MBG); Arena, Government Forest, April 10, 1924, Broadway s. n. (FM); exact locality and date lacking, Purdie s. n. (K); Maracas, road to bay, Aug. 18, 1927, Broadway 6733 (B, K).

BRITISH GUIANA: Mazaruni River, Aug., 1880, Jenman 799 (K); Oreala, savanna, Oct., 1879, im Thurn s. n. (K); prope cataractam Kaietur, Aug., 1866, Appun 1771 (K); data incomplete, Schomburgk 311 (B, BB, DC, FM, K, US).

DUTCH GUIANA: data incomplete, 1843, Hostmann 549 (B, BB, BM, K); March, 1842, Hostmann 469 (DL); Hostmann 55 (B).

FRENCH GUIANA: data incomplete, 1820, *Perrottet s. n.* (DL); 1819-21, *Poiteau s. n.* (DL).

BRAZIL: AMAZONAS: Tonantins, ripis rivi inundatis, Nov. 11, 1927, *Ducke 21613* (B, US); Rio Branco, June, 1909, *Ule 7826* (B, K); Rio Negro, gapo of south shore, May, 1851, *Spruce 1348* (B, BM, Bx, K); insula Ajarauy, Rio Branco, ad ripas, March, 1913, *Kuhlmann 3044* (B, US); Rio Antinamaray, ad fl. Rio Acre, silva paludosa, April 1, 1904, *Huber 21769* (B); PARA: beside the Jari, lower Amazon, Nov. 21, 1873, *Traill 519* (K); Port-Real, in the campo of Corasco, close to the village, Dec. 19, 1828, *Burchell 8510* (K); ad cataractas fl. Aripecuru, Dec., 1849, *Spruce 551* (B); MARANHÃO: exact locality lacking, Nov. 14, 1923, *Sneathage 328* (B).

For a species which is so widespread, *M. trifida* is rather uniform in all features which could be considered as specific. The most variable are the shape and size of the leaves, which may be epitomized as normally broadly ovate-oblong, obscurely cordate, and ranging from 8 to 12 cm. in length. Individual specimens occasionally bear leaves which vary to elliptic-lanceolate, however, and the size may be considerably reduced.

The species occurs upon both Atlantic and Pacific slopes in Central America, frequenting rather moist thickets at relatively low altitudes. Rather common in Panama, it is of relatively infrequent occurrence northward, at present being unrecorded from Nicaragua and Salvador. At its northern limit in British Honduras, it has been found in recently cultivated fields, probably indicating an advancing distribution.

In South America there appears to have been two main directions of dispersal, one invading the Colombian river valleys draining into the Atlantic Ocean, Venezuela, and the Guianas, where it is a frequent liana of moist, low thickets and alluvial flats; and the second, probably an extension of the former, down the Orinoco and Rio Negro valleys to the Amazon. The species here extends down the Amazon River valley as far as Para and Maranhão, choosing much the same habitat as northward, although apparently of less frequent occurrence.

An interesting instance of isolation in the distribution of *M. trifida* is found in its occurrence in the Province of Guayas, Ecuador, which is the only known locality of the genus upon the Pacific coast south of Panama. Here there is a parallel in the distribution of *Stemmadenia obovata* (Hook. & Arn.) K. Sch. var. *mollis* (Benth.) Woodson.

2. *Mesechites bicorniculata* (Rusby) Woodson, Ann. Mo. Bot. Gard. 19: 387. 1932.

Echites bicorniculata Rusby, Descr. So. Am. Pl. 86. 1920.

Minutely and densely puberulent, rarely glabrate, suffruticose lianas; stems relatively stout; leaves broadly oblong-elliptic, apex broadly obtuse, mucronulate, base broadly and rather obscurely cordate, 5-7 cm. long, 2.0-3.5 cm. broad, firmly membranaceous, either surface densely puberulent, the upper somewhat glabrescent at maturity; petiole 0.5-0.75 cm. long; nodal appendages mostly geminate; inflorescence about half as long as the subtending leaves, conspicuously compound, the floriferous branches somewhat shorter than the sterile, primary peduncle, bearing 10-20 greenish-white, red- or purple-flushed flowers; pedicels about 0.4 cm. long, somewhat accrescent at maturity, the subtending bracts minutely ovate, scarious; calyx-lobes broadly ovate-oblong, obtuse or rounded, 0.2-0.3 cm. long; corolla salverform, the tube about 1.0-1.25 cm. long, about 0.15 cm. in diameter at the base, somewhat enlarged at the insertion of the stamens, glabrous without, the lobes obliquely obovate-oblong, 0.5-0.75 cm. long, sharply reflexed; anthers 0.5 cm. long; ovary oblong-ovoid, about 0.2 cm. long, minutely puberulent-papillate; stigma 0.2 cm. long; nectaries compressed-ovoid, about half as long as the ovary; follicles unknown.

COLOMBIA: MAGDALENA: thickets, plains near sea-level, Cienaga, Sept. 10, 1898, Smith 1640 (FM, K, NY, TYPE, MBG, photograph and analytical drawings); SANTANDER [ATLANTICO?]: Badillo, alluvial flat, Rio Magdalena, alt. 80-90 m., Jan. 16, 1918, Pennell 5911 (MBG, NY).

This species is scarcely distinguishable from the preceding save by the conspicuous indument, and might better be classified as a variety upon examination of a greater representation of both.

3. *Mesechites Sanctae-Crucis* (S. Moore) Woodson, Ann. Mo. Bot. Gard. 19: 387. 1932.

Echites (*§ Mesechites*) *Sanctae-Crucis* S. Moore, Trans. Linn. Soc. Bot. II. 4: 396. 1895.

Echites trifida Jacq. var. *Sanctae-Crucis* (S. Moore) Malme, Bull. Herb. Boiss. II. 4: 196. 1904.

Suffruticose lianas; stems relatively stout, minutely puberulent when young, glabrate or puberulent at the nodes when fully

mature; leaves oblong-elliptic to obovate-oblong, apex obtuse to abruptly acuminate, mucronulate, base broadly and obscurely cordate, 5–12 cm. long, 2.5–7.0 cm. broad, firmly membranaceous, either surface glabrous or essentially so; petiole 0.75–1.25 cm. long; nodal appendages obsolete; inflorescence about half as long as the subtending leaves, conspicuously compound, the floriferous branches somewhat shorter than the sterile, primary peduncle, bearing 15–35 congested, yellowish, reddish-flushed flowers; pedicels 0.75–1.0 cm. long, the subtending bracts minutely ovate, scarious; calyx-lobes ovate-oblong, obtuse to broadly acute, 0.2 cm. long, essentially glabrous; corolla salverform, the tube 1.25–1.5 cm. long, about 0.15 cm. in diameter at the base, somewhat enlarged at the insertion of the stamens, the lobes obliquely obovate-oblong, 0.4–0.5 cm. long, sharply reflexed; anthers 0.4 cm. long; ovary oblongoid, 0.2 cm. long, glabrous; stigma 0.25 cm. long; nectaries oblongoid, about half as long as the ovary; follicles relatively slender, continuous or essentially so, 12–25 cm. long, glabrous; seeds 1.25 cm. long, the brilliantly tawny coma 1.5 cm. long.

PARAGUAY: zwischen Rio Apa und Rio Aquidaban, Dec., 1908, *Fiebrig 4315* (B, BM, K); Pilcomayo River, Jan., 1888–90, *Morong 895* (FM, MBG, NY); near Asuncion, 1888–90, *Morong 380* (MBG, NY); prope Concepcion, Oct., 1901, *Hassler 7621* (BB, BM, K); Rio Paraguay à l'Assomption, Febr.–April, 1874, *Balansa 1572* (K, S); in regione cursus inferioris fl. Pilcomayo, date lacking, *Rojas 2* (B); Colonia Riso prope Rio Apa, Oct. 13–19, 1893, *Malme 1058* (BM, S).

In the relative dimensions of the calyx and corolla, exappendiculate nodes, and characteristic indument of the stem, this species appears to be quite distinct from *M. trifida*, its nearest relative evidently being the following:

4. *Mesechites acuminata* (R. & P.) Muell.-Arg. *Linnaea* 30: 446. 1860.

Echites acuminata R. & P. *Fl. Peruv.* 2: 19. *pl. 134.* 1799; A. DC. in DC. *Prodr.* 8: 449. 1844; Miers, *Apoc. So. Am.* 197. 1878.

Echites trifida Jacq. f. *puberula* Mg. *Notizblatt* 9: 80. 1924.
Suffruticose lianas; stems relatively stout, minutely puberulent when young, glabrate or puberulent at the nodes when fully mature, rarely glabrous; leaves broadly oblong-elliptic to oblong-

lanceolate, apex acuminate to acute, mucronulate, base rounded, usually rather obscurely cordate, 8–12 cm. long, 3.5–7.0 cm. broad, coriaceous, either surface minutely puberulent to glabrate or glabrous; petiole 1.25–2.0 cm. long; nodal appendages mostly geminate; inflorescence much shorter than the subtending leaves, the floriferous branches about as long as the sterile primary peduncle, bearing 5–12 greenish-white, red- or purplish-flushed flowers; pedicels 1.25–1.5 cm. long, the subtending bracts minutely ovate, scarious; calyx-lobes broadly ovate-oblong, broadly obtuse to rounded, 0.4–0.5 cm. long, glabrous or essentially so; corolla salverform, the tube 2.25–2.5 cm. long, about 0.2 cm. in diameter at the base, somewhat enlarged at the insertion of the stamens, the lobes obliquely obovate-oblong, 1.5–1.75 cm. long, sharply reflexed; anthers 0.5 cm. long; ovary oblong-ovoid, about 0.3 cm. long, essentially glabrous; stigma 0.2 cm. long; nectaries compressed-ovoid, about half as long as the ovary; follicles slender, continuous, 20–30 cm. long, glabrous; seeds about 1 cm. long, the brilliantly tawny coma about 2 cm. long.

PERU: LORETO: stromgebiet des Maranons von Jquitos aufwärts bis zur Santiago-Mündung am Pongo de Manseriche, Jan. 12, 1925. *Tessmann* 4918 (B); AYACUCHO: Rio Apurimac valley near Kimpitriki, alt. 400 m., edge of dense forest along beach, May 10, 1929, *Killip & Smith* 22932 (US); Aina, between Huanta and Rio Apurimac, alt. 750–1000 m., May 7–17, 1929, *Killip & Smith* 28741 (MBG, US); CAJAMARCA: tal des Flusses Tabaconas, zwischen dem dorfe Tabaconas und der Hacienda Charape, alt. 1500 m., May 7, 1912, *Weberbauer* 6243 (B, FM, G, US); JUNIN: La Merced, alt. 700 m., thickets, May 20–June 4, 1929, *Killip & Smith* 23410 (US); MAYNAS: 1831, *Poeppig* 53 (V, MBG, photograph and analytical drawings); DATA INCOMPLETE: *Paeon* 589 (BB, TYPE, MBG, photograph).

BOLIVIA: BENI: Guani, alt. 2000 ft., May, 1886, *Rusby* 2393 (G, NY, PA); Rurrenabaque, Jan. 27, 1922, *Cerdeñas* 2042 (K, NY, US); LA PAZ: Tumupasa, Dec. 11, 1901, *Williams* 346 (BM, NY).

5. *Mesechites Mansoana* (A. DC.) Woodson, comb. nov.

Mesechites sulphurea Muell.-Arg. in Mart. Fl. Bras. 6:

151. pl. 46. 1860, not *Echites sulphurea* Vell. Fl. Flum. 109. 1830; Icon. 3: pl. 26. 1827.

Echites Mansoana A. DC. in DC. Prodr. 8: 448. 1844; Miers, Apoc. So. Am. 201. 1878.

Glabrous, suffruticose lianas; stems relatively stout; leaves lanceolate- to broadly oblong-elliptic, apex rather abruptly acute to acuminate, mucronulate, base obtuse to rounded, 5–9

cm. long, 2.5–4.0 cm. broad, heavily coriaceous, either surface glabrous, the upper somewhat nitidulous; petiole 0.5–1.0 cm. long; nodal appendages mostly solitary; inflorescence one-third to one-half as long as the subtending leaves, conspicuously compound, the floriferous branches about half as long as the sterile, primary peduncle, bearing 12–30 congested, greenish-white or yellowish flowers; pedicels 0.75–1.0 cm. long, the subtending bracts minutely ovate, scarious; calyx-lobes broadly ovate-oblong, obtuse to broadly acute, 0.3–0.5 cm. long, glabrous; corolla salverform, the tube 1.75–2.0 cm. long, about 0.2 cm. in diameter at the base, somewhat enlarged at the insertion of the stamens, the lobes obliquely obovate-oblong, 0.5–0.75 cm. long, sharply reflexed; anthers 0.5 cm. long; ovary oblong-ovoid, about 0.15 cm. long, glabrous; stigma 0.2 cm. long; nectaries oblongoid, equaling or slightly longer than the ovary; follicles relatively slender, somewhat articulated, 10–15 cm. long, glabrous; seeds 0.75 cm. long, the brilliantly tawny coma 1.75 cm. long.

BRAZIL: GOIÁS: near Cauceia, Febr., 1840, Gardner 3881 (K); MINAS GERAES: Bello Horizonte, Campo do Correio do Leitão, Febr. 6, 1919, Gehrt 3219 (B); Lagoa Santa, in marginibus silvae, June, year lacking, Warming s. n. (C, S); Sabara, Jan., 1916, Hoehne 8715 (B); exact locality lacking, 1892, Galzio 19623 (K); SÃO PAULO: Cajuru, March 18, 1857, Regnell 881 (S); MATTO GROSSO: Cuyaba, 1832, Manso & Lhotzky 34 (B, DC, TYPE); Tapurapuan, March, 1909, Hoehne 1270 (B); Cuyaba, Jan. 13, 1894, Malme s. n. (S); same locality, June 14–19, 1902, Malme s. n. (S); DATA INCOMPLETE: Tamberlik s. n. (V); Warming s. n. (C); Riedel s. n. (G, V).

BOLIVIA: SANTA CRUZ: Prov. Sara, alt. 450 m., Febr. 12, 1926, Steinbach 7456 MBG, S, US).

The plate in Vellozo's 'Icones' cited above recalls the general habit of *Prestonia coalita* (Vell.) Woodson, and there appears to be little indeed to identify it with *Echites Mansoana* A. DC. as represented by Manso & Lhotzky's specimen in the de Candolle herbarium, referred to *Mesechites sulphurea* by Mueller-Argoviensis. The opposite lateral inflorescences shown in Vellozo's plate unquestionably exclude the plant depicted from the genus *Mesechites*.

6. *Mesechites citrifolia* (HBK.) Woodson, Ann. Mo. Bot. Gard. 19: 387. 1932.

Echites citrifolia HBK. Nov. Gen. 3: 216. 1819; A. DC. in DC. Prodr. 8: 465. 1844; Miers, Apoc. So. Am. 200. 1878.

Echites brevipes Benth. Pl. Hartw. 216. 1845.

Mesechites brevipes (Benth.) Muell.-Arg. Linnaea 30: 454. 1860.

Amblyanthera citrifolia Müll. ex Miers, loc. cit. 1878, sphalm in synon.

Mitorus brevipes (Benth.) Miers, loc. cit. 223. 1878.

Glabrous, suffruticose lianas; stems relatively stout; leaves ovate to ovate-lanceolate, acuminate, mucronulate, base broadly and rather obscurely cordate, 5–10 cm. long, 2.5–5.0 cm. broad, heavily coriaceous, either surface glabrous; petiole 0.2–0.5 cm. long; nodal appendages several; inflorescences about half as long as the subtending leaves, the floriferous branches somewhat shorter than the sterile, primary peduncle, bearing 10–25 congested, greenish-white, purple-tinged flowers; pedicels about 0.5 cm. long, somewhat accrescent at maturity, the subtending bracts minutely ovate-lanceolate, scariosus; calyx-lobes ovate-lanceolate, narrowly acuminate to subacute, 0.3–0.4 cm. long, glabrous; corolla salverform, the tube 1.25–1.5 cm. long, about 0.15 cm. in diameter at the base, somewhat enlarged at the insertion of the stamens, the lobes obliquely obovate-oblong, 0.75–1.0 cm. long, sharply reflexed; anthers 0.3 cm. long; ovary oblong-ovoid, about 0.15 cm. long, glabrous; stigma 0.15 cm. long; nectaries compressed-ovoid, about half as long as the ovary; follicles slender, conspicuously articulated or moniliform, 10–15 cm. long, glabrous; seeds 0.75 cm. long, the tawny coma about 1 cm. long.

COLOMBIA: ANTIOQUIA: thickets below Santa Barbara, alt. 900–1500 m., Sept. 21, 1922, Pennell 10884 (NY, US); VALLE DE CAUCA: Vijes, in valle fl. Cauca, alt. 1025 m., Nov., 1876, Andre 2488 (K, MBG, photograph); bei Las Fuentes, am Rio Dagua, alt. 400 m., Aug., 1894, Lehmann 3809 (US); CUNDINAMARCA: La Palmilla, Nov.–Dec., year lacking, Goudot 2 (K, MBG, photograph); La Mesa, near Bogota, date lacking, Hartweg 1195 (K, V, MBG, photograph); TOLIMA: open slope, Libano, alt. 1000–1200 m., Dec. 26–29, 1917, Pennell 3438 (MBG, NY, US); prope S. Ana Novogranatensis, date lacking, Humboldt & Bonpland s. n. (B, TYPE).

Probably the most distinct of the continental species of *Mesechites* because of its unmistakable calyx. The numerous nodal appendages further serve to distinguish it from all its congeners.

Subgen. II. *DIDYMADENIA* Woodson, n. subgen.

Corolla cream-colored or pink; foliar glands 2, fusiform, clustered radially; suffrutescent lianas of Cuba and Hispaniola. *Spp. 7–10.*

KEY TO THE SPECIES

- a. Inflorescence lateral only, conspicuously compound; species of Hispaniola.
- b. Corolla-tube 1.0–1.5 cm. long; leaves ovate to ovate-lanceolate. .7. *M. repens*
- bb. Corolla-tube 0.4–0.6 cm. long; leaves narrowly elliptic to linear-lanceolate.8. *M. angustifolia*
- aa. Inflorescence both lateral and subterminal, obscurely compound; species of Cuba.
- b. Corolla bright pink, the tube 2–4 cm. long.9. *M. rosea*
- bb. Corolla cream-colored, the tube 0.2–0.4 cm. long.10. *M. minima*

7. *Mesechites repens* (Jacq.) Miers, Apoc. So. Am. 229.
1878.

Echites repens Jacq. Enum. Syst. Pl. Carib. 13. 1760;
A. DC. in DC. Prodr. 8: 449. 1844.

Mesechites lanceolata Miers, loc. cit. 230. 1878.

Glabrous, suffrutescent lianas; stems relatively slender; leaves ovate to ovate-lanceolate, shortly acuminate to obtuse, usually mucronulate, base rounded and very obscurely cordate, 1.5–6.0 cm. long, 0.3–2.5 cm. broad, membranaceous, glabrous without; petiole 0.1–0.6 cm. long; nodal appendages extremely inconspicuous; inflorescence lateral, conspicuously compound, much surpassing the subtending leaves, bearing 3–25 pale pink or cream-colored flowers; pedicels 0.1–0.3 cm. long, the subtending bracts minutely ovate-lanceolate; calyx-lobes narrowly lanceolate, 0.15–0.2 cm. long, glabrous; corolla salverform, the tube 1.0–1.5 cm. long, about 0.1 cm. in diameter at the base, somewhat enlarged at the insertion of the stamens, the lobes broadly obovate-dolabriform, 0.7–0.9 cm. long, widely spreading; anthers 0.15–0.2 cm. long; ovary ovoid, 0.1 cm. long, glabrous; stigma 0.15 cm. long; nectaries compressed-ovoid, somewhat shorter than the ovary; follicles slender, 15–20 cm. long, conspicuously articulated or moniliform, glabrous; seeds 0.5–0.6 cm. long, the brilliantly tawny coma about 1 cm. long.

HATTI: dry hills near l'Atalaye Plantation, vicinity of St. Michel de l'Atalaye, alt. 350 m., Nov. 18, 1925, Leonard 7155 (NY, US); dry region northeast of U. West Indies Plantation, vicinity of St. Michel de l'Atalaye, Sept. 4, 1903, Nash 940 (NY); rocky hillside, Bayeux, near Port Margot, Aug. 5, 1903, Nash 158 (FM, NY); Petite Gonave Island, July 9–10, 1920, Leonard 5251 (US); Mt. Maleuvre to Pilate, Aug. 20, 1903, Nash 584 (NY); Petionville, alt. 1000 m., hillside, Sept. 6, 1903, Nash 996 (NY); on sea island, Bayeux, near Port Margot, Aug. 9, 1903, Nash 286 (FM, NY); xerophytic formation, alt. 1500 ft., San Michel, Aug. 5, 1905, Nash & Taylor 1385 (B, NY, US); dry slope, northeast of Gros Morne, Dept. Artibonite, alt. 235 m.,

Febr. 17, 1926, *Leonard* 9833 (NY, US); vicinity of Pikmi, Gonave Island, July 5-9, 1920, *Leonard* 5159 (NY, US); Miragoane and vicinity, July 8, 1927, *Eyerdam* 414 (MBG, US); Massif de la Selle, Port au Prince, Morne de l'Hôpital, alt. 350 m., May 20, 1927, *Ekman* 8173 (B, S, US); prope Terre-Neuve, Sept. 3, 1899, *Buch* 83 (B); ad Jerémie, Jan. 18, 1888, *Eggers* 3389 (B); Camp-Perrin, alt. 200 m., Aug. 29, 1888, *Christ* 1904 (B); Port au Prince, July, 1872, *le Jolis* (BB); vine on shrubs, road to Gros Morne, vicinity of Bassin Bleu, alt. 630-1500 m., April 15, 1929, *Leonard & Leonard* 14682 (US); Camp 4, Marmelade, alt. 2775 ft., Aug. 1-2, 1905, *Nash & Taylor* 1309 (NY); common in dry thickets of La Vallée valley, Tortue Island, Jan. 6, 1929, *Leonard & Leonard* 11735 (NY, US); Ile La Navasse, east of the lighthouse, rare, Oct. 21, 1928, *Ekman* 10835 (B, S); data incomplete, *Jaeger* s. n. (B, BB, G, K, S, US); *Ehrenberg* 159 (B).

DOMINICAN REPUBLIC: Barahona, April, 1910, *Fuentes* 34 (BM, FM, G, K, NY, S, US); prope Mamial de Oco, alt. 300 m., Oct., 1910, *Tuerckheim* 3805 (K, NY); Pto. Pinta, April 23, 1887, *Eggers* 1633 (DL, NY, US); Santo Domingo, near the city, July, year lacking, *Schomburgk* 22 (K); Haina, fence-row, Sept., 1921, *Faris* 568 (US); prope Puerto Plata, in fruticosis ca. oppidum, March 30, 1887, *Eggers* 1721 (B, DL, US); pine forest, San Jose de las Matas, Prov. Santiago, Aug. 26, 1929, *Valeur* 96 (MBG, US); Beata Island, Febr. 23, 1922, *Ostenfeld* 334 (C); data incomplete, Sept., 1909, *Tuerckheim* 2586 (BM, K, NY); Jan.-March, 1871, *Wright Parry & Brummel* 409 (US); 1856, *Mayerhof* 28 (B).

Mesechites lanceolata Miers was founded only on the illustration of *Nerium foliis lanceolatis* Plum. Pl. Am. 1: 20. pl. 27, fig. 1, and no specimens annotated with that name are to be found among Miers's study-specimens in the British Museum (Natural History). Although characterized by Miers as "extremely different from *M. repens*," there appears little to lead one to that conclusion either in Plumier's plate or in Miers's description. Lack of space prohibits the citation of numerous additional collections of this relatively common species.

8. *Mesechites angustifolia* (Poir.) Miers, Apoc. So. Am. 230. 1878.

Echites angustifolia Poir. Encycl. Suppl. 2: 537. 1811; A. DC. in DC. Prodr. 8: 449. 1844, not Benth.

Echites linearifolia Ham. Prodr. Pl. Ind. Occ. 31. 1825; A. DC. loc. cit. 1844, not Stadelm.

Mesechites linearifolia (Ham.) Miers, loc. cit. 1878.

Amblyanthera angustifolia (Poir.) Muell.-Arg. Linnaea 30: 430. 1860.

Echites breviflora Urb. Symb. Ant. 5: 464. 1908.

Glabrous, suffrutescent lianas; stems relatively slender; leaves narrowly elliptic- to linear-lanceolate, acuminate to subcaudate,

base obtuse or rounded, obscurely cordate, 3–10 cm. long, 0.3–2.5 cm. broad, firmly membranaceous, glabrous; petiole 0.2–0.5 cm. long; nodal appendages very inconspicuous; inflorescence lateral, conspicuously compound, equalling or somewhat surpassing the subtending leaves, bearing 2–10 congested, cream-colored flowers; pedicels 0.5–0.8 cm. long, the subtending bract minutely ovate-lanceolate; calyx-lobes narrowly trigonal, about 0.1 cm. long, glabrous; corolla salverform, the tube 0.4–0.6 cm. long, about 0.15 cm. in diameter at the base, the lobes obliquely obovate, 0.4–0.5 cm. long, widely spreading; anthers 0.2 cm. long; ovary ovoid, 0.075 cm. long, glabrous; stigma 0.15 cm. long; nectaries compressed-oblongoid, about as long as the ovary; follicles slender, 10–20 cm. long, conspicuously articulated or moniliform; seeds 0.5 cm. long, the tawny coma about 1.25 cm. long.

HATTI: dry thicket among rocks, cliff west of village, vicinity of Marmelade, alt. 800 m., Dec. 20, 1925, *Leonard 8332* (US); on shrubs in thickets, Mt. la Cidre, vicinity of St. Michel de l'Atalaye, alt. 350 m., Dec. 16, 1925, *Leonard 8048* (NY, US); hillside, near sea-level, Bayeux, near Port Margot, Aug. 4, 1903, *Nash 136* (FM, K, NY); pine woods, on low shrubs, Marmelade, alt. 3400 ft., Aug. 25, 1903, *Nash 789* (NY); Ile La Tortue, main ridge west of La Vallée, alt. 350 m., May 24, 1923, *Ekman 4116* (B, S); Dept. du Nord, prope Cap Hatien, alt. 450 m., Dec. 2, 1924, *Ekman 2725* (B, S); Port au Prince, alt. 1000 m., Aug., 1916, *Buch 1237* (B); Massif de la Selle, Nouvelle Touraine, ridges above Chapelle Taure, grassy slopes, alt. 1700 m., Aug. 22, 1924, *Ekman 1580* (S, US); twining on tree, table-land, trail to Au Palmiste, vicinity of Basse Terre, Tortue Island, March 23, 1929, *Leonard & Leonard 14013* (MBG, NY, US); climbing on shrubs, upper slope of Morne Haut Piton, vicinity of Bassin Bleu, alt. 630–1500 m., April 25, 1929, *Leonard & Leonard 15112* (US); montagnes du Trou d'Eau, hills north of Glare, on Étang Saumatre, on limestone, alt. 900 m., July 22, 1924, *Ekman 1083* (S); Massif du Nord, Cap Hatien, slope of Morne Haut du Cap, alt. 450 m., Dec. 2, 1924, *Ekman 2725* (US).

DOMINICAN REPUBLIC: prope Puerto Plata, June 20, 1887, *Eggers 1639* (B, DL, K, NY); Barahona, hills, alt. 500 m., Sept. 1910, *Fuertes 340* (BM, K, MBG, S); Morne Bellevue, ouest de Nancivet, alt. 600–700 m., Aug. 31, 1908, *Christ 1939* (B); data incomplete, 1802, *Poiteau s. n.* (DL, S).

The type specimen of *Echites breviflora* Urb. (*Eggers 1639*) is remarkable merely because of leaves which are somewhat broader than the norm for the species. Upon the same sheet in the herbarium at Berlin-Dahlem, however, a fragment was found with the typical narrowly lanceolate foliage.

9. *Mesechites rosea* (A. DC.) Miers, Apoc. So. Am. 232.
1878.

Echites myrtifolia R. & S. Syst. 4: 795. 1819; A. DC. in DC.

Prodri. 8: 473. 1844, not Poir.

Echites rosea A. DC. loc. cit. 450. 1844.

Mesechites myrtifolia (R. & S.) Muell.-Arg. Linnaea 30: 445.

1860; Miers, loc. cit. pl. 33A. 1878.

Echites torulosa Lam. ex Miers, loc. cit. 1878, nom. nud. in synon.

Nerium sarmentosum P. Browne, ex Miers, loc. cit. 1878, sphalm in synon.

Glabrous, suffrutescent lianas; stems relatively slender; leaves ovate or oval to oblong, infrequently lanceolate, apex abruptly acute to obtuse, usually mucronulate, base obtuse to rounded, obscurely cordate, 0.75–3.0 cm. long, 0.25–2.0 cm. broad, subcoriaceous, glabrous; petiole 0.1–0.2 cm. long; nodal appendages extremely inconspicuous; inflorescence lateral or subterminal, very obscurely compound, about as long as the subtending leaves when lateral, much shorter when subterminal, bearing 1–5 bright pink flowers; pedicels 0.3–0.6 cm. long, the subtending bracts minutely ovate; calyx-lobes ovate-lanceolate, acute, 0.2–0.3 cm. long, glabrous; corolla salverform, the tube 2.0–4.0 cm. long, about 0.5 cm. in diameter at the base, somewhat enlarged at the insertion of the stamens, the lobes obliquely obovate-dolabriform, 1.5–2.5 cm. long, widely spreading; anthers 0.5 cm. long; ovary ovoid, 0.1 cm. long, glabrous; stigma 0.15 cm. long; nectaries compressed ovoid-oblongoid, about as long as the ovary; follicles relatively slender, 15–45 cm. long, conspicuously articulated or moniliform; seeds 0.5–0.7 cm. long, the pale yellowish coma about 2 cm. long.

CUBA: PINAR DEL RIO: pinelands, San Gabriel to Pinal de la Catalina, Jan. 18, 1912, Shafer 11861 (MBG, US); in grass, palm barrens west of Guane, Nov. 21–22, 1911, Shafer 10383 (MBG, NY, US); border of lagoon, vicinity of Pinar del Rio, Sept. 5–12, 1910, Britton Britton & Gager 6969 (NY); near Coloma, March 18, 1900, Palmer & Riley 348 (NY, US); ISLA DE PINOS: near Nueva Gerona, Dec. 9, 1903, Curtis 1102 (FM); same locality, June 28, 1900, Palmer & Riley 871 (NY, US); exact locality lacking, June 25–July 10, 1901, Taylor 170 (FM, MBG, US); HAVANA: Lomas de las Jatas, Guanabacoa, April 19, 1914, Ekman s. n. (S); exact locality lacking, 1825, Sagra 120 (DC); no data, Drummond s. n. (K); SANTA CLARA: Cieneguita, June 5, 1895, Combs 158 (B, FM, K, MBG); hillside, Castillo de Jagua, Cienfuegos Bay, Febr. 25, 1910, Britton Earle & Wilson 4598 (NY); CAMAGUEY: savanna south of Sierra Cubitas, Febr. 20–21, 1909, Shafer 493 (NY, US); Cayo Ballenato Grande, March 18, 1909, Shafer 941 (NY, US); vicinity of Pueblo Romano, Cayo Romano, Oct. 8–9, 1909, Shafer 2446 (NY, US); dry soil, savannas near

Camaguey, April 2-7, 1912, Britton Britton & Cowell 13085 (NY, US); ORIENTE: Gibara, Jan. 23, 1902, Pollard Palmer & Palmer 2 (US); opposite Gibara to Punta Hicacos, April 21, 1909, Shafer 1500 (NY); Santiago, Morro Hill, Febr. 3, 1899, Milesbaugh 1102 (FM); Santiago, 1899, Haward 16 (NY); coral limestone, U. S. Naval Station, Guantanamo Bay, March 17-30, 1909, Britton 2080 (BM, NY, US); rocky coastal hills, Cabana Bay, March 17, 1912, Britton & Cowell 12704 (NY); vicinity of Baracoa, Febr. 1-7, 1902, Pollard Palmer & Palmer 248 (MBG, US); "The Ovens," Santiago, Febr. 4, 1899, Milesbaugh 1113 (FM); La Magdalena, Cayamas, Sept. 5, 1907, Earle & Baker 2451 (B, NY); in collibus calcar. siccis ad Aguadores, prope Santiago, Nov. 4, 1917, Ekman 8698 (S); Sierra de Nipe ad bas. mont. Loma Mensura in pinetis, Oct. 19, 1914, Ekman 3196 (S); DATA INCOMPLETE: Wright 1662 (BB, Bx, BM, G, K, MBG).

10. *Mesechites minima* (Britton & Wilson) Woodson, Ann. Mo. Bot. Gard. 19: 386. 1932.

Echites minima Britton & Wilson, Mem. Torrey Bot. Club 16: 94. 1920.

Glabrous, suffrutescent lianas; stems relatively slender; leaves oblong to ovate-oblong, apex obtuse to rounded, rarely acute, mucronulate, base rounded and very obscurely cordate, 0.4-2.0 cm. long, 0.2-0.6 cm. broad, subcoriaceous, glabrous; petiole about 0.1 cm. long; nodal appendages obsolete; inflorescence both lateral and subterminal, very obscurely compound, somewhat longer than the subtending leaves, bearing 1-5 cream-colored flowers; pedicels 0.1-0.3 cm. long, the subtending bracts minutely ovate; calyx-lobes narrowly trigonal, somewhat less than 0.1 cm. long, glabrous; corolla salverform, the tube 0.2-0.4 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely obovate, 0.2 cm. long, widely spreading; anthers 0.1 cm. long, glabrous; ovary ovoid, about 0.075 cm. long, glabrous; stigma about 0.05 cm. long; nectaries compressed-ovoid, somewhat shorter than the ovary; mature follicles unknown.

CUBA: SANTA CLARA: palm barren, Motembo, Jan. 4, 1919, Leon & Fortun 8649 (NY); wet sandy savanna, near Mordazo, Dec. 29, 1915, Leon & Cazanas 5974 (NY); CAMAGUEY: Loma de la Guana Maguilla, east of Camaguey City, Aug. 25, 1925, Acuna 3795 (NY); moist places, climbing over grass, savanna, Queen City to Minas, Nov. 21, 1909, Shafer 2928 (NY); prope Santayana, in palmcetis, Oct. 4, 1922, Ekman 15334 (B, S); ORIENTE: in dry grassy place, barren savannas, southeast of Holguin, Nov. 26-29, 1909, Shafer 2955 (NY); prope Holguin, in mont. Cerro de Fraile, Oct. 28, 1914, Ekman 3231 (B, S).

The parallelism of the floras of Cuba and Hispaniola is strikingly illustrated by the four species of subgen. *Didymadenia*, a large-

flowered, common species, and a very small-flowered, rarer species occurring upon either island, and bearing much the same relationship to each other in morphology and habitat.

EXCLUDED OR UNCERTAIN SPECIES

Mesechites torulosa (L.) Miers, Apoc. So. Am. 229. 1878 = *Mandevilla torosa* (Jacq.) Woodson, Ann. Mo. Bot. Gard. 19: 64. 1932.

Mesechites angustata Miers, loc. cit. 231. 1878 = *Mandevilla Benthamii* (A. DC.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 171. 1895.

Mesechites subcarnosa (Benth.) Miers, loc. cit. 1878 = *Mandevilla subcarnosa* (Benth.) Woodson, in Gleason, Bull. Torrey Bot. Club 58: 453. 1931.

Mesechites Brownei (A. DC.) Miers, loc. cit. 232. 1878 = *Mandevilla torosa* (Jacq.) Woodson, Ann. Mo. Bot. Gard. 19: 64. 1932.

Mesechites hastata Miers, loc. cit. 233. 1878 = *Mandevilla subsagittata* (R. & P.) Woodson, loc. cit. 69. 1932.

Mesechites dichotoma (HBK.) Miers, loc. cit. 1878 (*Echites dichotoma* HBK. Nov. Gen. 3: 217. 1819). The type specimen of this species has not been found for examination. From the description, the identity of the plant might be guessed as *Mesechites trifida* (Jacq.) Muell.-Arg., but the latter species is at present unreported from the neighborhood of Quito, from which the former is said by Kunth to have come. *M. trifida* has been collected upon several occasions in the Province of Guayas, however.

Mesechites Guayaquilensis (Benth.) Miers, loc. cit. 1878 = *Mandevilla subsagittata* (R. & P.) Woodson, loc. cit. 69. 1932.

Mesechites hirtella (HBK.) Miers, loc. cit. 234. 1878 = *Mandevilla subsagittata* (R. & P.) Woodson, loc. cit. 1932.

Mesechites Oaxacana (A. DC.) Miers, loc. cit. 1878 = *Mandevilla oaxacana* (A. DC.) Hemsl. Biol. Centr.-Am. Bot. 2: 316. 1882.

Mesechites hirtellula Miers, loc. cit. 1878 = *Mandevilla oaxacana* (A. DC.) Hemsl. loc. cit. 1882.

Mesechites jasminiflora (Mart. & Gal.) Miers, loc. cit. 235.

1878 = *Mandevilla subsagittata* (R. & P.) Woodson, loc. cit.

1932.

Mesechites Andrieuxii (Muell.-Arg.) Miers, loc. cit. 1878 = *Mandevilla Andrieuxii* (Muell.-Arg.) Hemsl. loc. cit. 1882.

Mesechites Guianensis (A. DC.) Miers, loc. cit. 1878 = *Mandevilla subspicata* (Vahl) Mgf. Rec. Trav. Bot. Néerl. 22: 380. 1926.

III. MANDEVILLA Lindl.¹⁸

Mandevilla Lindl. Bot. Reg. n. s. 3: pl. 7. 1840; Benth. & Hook. Gen. Pl. 2: 726. 1876; Miers, Apoc. So. Am. 184. 1878; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 170. 1895; Dalla Torre & Harms, Gen. Siphon. 6659. 1904.

Exothostemon G. Don, Gen. Hist. Dichlam. Pl. 4: 82. 1838;

Miers, loc. cit. 238. 1878, in part.

Laseguea A. DC. in DC. Prodr. 8: 481. 1844; ibid. Ann. Sci. Nat. Bot. III. 1: 260. 1844; Muell.-Arg. in Mart. Fl. Bras. 6¹: 134. 1860; Benth. & Hook. loc. cit. 725. 1876; Miers, loc. cit. 248. 1878; Baill. Hist. Pl. 10: 216. 1891; K. Sch. loc. cit. 171. 1895; Dalla Torre & Harms, loc. cit. 6660. 1904.

Dipladenia A. DC. loc. cit. 1844; Muell.-Arg. loc. cit. 120. 1860; Benth. & Hook. loc. cit. 726. 1876; Miers, loc. cit. 153. 1878; K. Sch. loc. cit. 168. 1895.

Heterothrix Muell.-Arg. loc. cit. 133. 1860; Miers, loc. cit. 264. 1878.

Amblyanthera Muell.-Arg. loc. cit. 141. 1860; Miers, loc. cit. 185. 1878, not Blume.

Eriadenia Miers, loc. cit. 117. 1878; Baill. loc. cit. 218. 1891; Dalla Torre & Harms, loc. cit. 6649. 1904.

Micradenia Miers, loc. cit. 158. 1878.

Homaladenia Miers, loc. cit. 164. 1878.

Angadenia Miers, loc. cit. 173. 1878, in part.

¹⁸ A motion to retain the name *Mandevilla* Lindl. when that genus shall be considered as congeneric with *Exothostemon* G. Don. has been indorsed by Dr. Fr. Markgraf, Berlin-Dahlem, and the writer and forwarded to the International Committee on Genera Conservanda in care of Dr. T. A. Sprague, Kew. This motion reviewed in detail (1) the popularity of *Mandevilla* and the disuse of *Exothostemon*; (2) the confusion relative to the use of the latter genus; (3) and particularly the large number of nomenclatorial changes which would be involved in the resurrection of the older name.

Temnadenia Miers, loc. cit. 207. 1878, in part.

Echites of many authors, in part, not P. Br.

Lactescent, suffruticose or suffrutescent lianas, undershrubs, and herbs. Stems volubile, ascending, or erect, terete or alate; branches usually opposite below, becoming alternate above. Leaves opposite or verticillate, the ventral surface bearing several inconspicuous, glandular emergences clustered at the base or distributed along the length of the midrib, rarely eglandular; petioles usually somewhat girdling at the node into an appendiculate, stipular ring. Inflorescence predominantly lateral, occasionally terminal or subterminal, racemose, simple or very rarely obscurely compound, bracteate, multiflorous to subuniflorous. Calyx 5-parted, the lobes equal or subequal, cleft nearly to the receptacle, imbricated, bearing within 5-many opposite, alternate, or indefinitely and uniformly distributed squamellae. Corolla infundibuliform, salverform, or tubular-salverform, the tube straight or somewhat gibbous, the limb actinomorphic, 5-parted, dextrorsely convolute. Stamens 5, the anthers connivent and agglutinated to the stigma, consisting of 2 parallel, uniformly fertile sporangia borne ventrally near the apex of an enlarged, sagittate, truncate or obtusely 2-auriculate, peltate connective; pollen granular; filament short, subcylindrical, usually densely puberulent. Carpels 2, united at the apex by an elongate, stylar shaft surmounted by the pentagonal-umbraculiform stigma; ovules many, several-seriate, borne upon an axile, binate placenta. Nectaries 2-5, rarely obsolete, separate or somewhat concrescent at the base. Follicles 2, apocarpous, terete, dehiscing along the ventral suture, containing many dry, subscaphiform, truncate, apically comose seeds.

Type species: *Mandevilla laxa* (R. & P.) Woodson, Ann. Mo. Bot. Gard. 19: 68. 1932.

KEY TO THE SUBGENERA AND SECTIONS

- A. Corolla-tube straight, not gibbous or arcuate; squamellae predominantly numerous, in groups alternate with the calyx-lobes or indefinitely and uniformly distributed (solitary and opposite the calyx-lobes in *M. funiformis*); upper surface of leaves glandular at the base of the midrib, or eglandular (sparsely glandular along the midrib in *M. congesta* and *M. callista*)..... Subgen. I. EU~~M~~ANDEVILLA

- B. Corolla salverform or tubular-salverform.
- C. Anthers auriculate.
- D. Nectaries 5.
 - E. Nectaries equaling or somewhat surpassing the ovary; lianas of Mexico and Central America..... Sect. 1. TUBIFLORAE
 - EE. Nectaries shorter than the ovary (equaling them in *M. apocynifolia*); low twiners of Jamaica and suffrutescent herbs of Mexico..... Sect. 2. TOROSAE
- DD. Nectaries 2; species of South America..... Sect. 4. TENUIFOLIAE
- CC. Anthers truncate, or merely somewhat emarginate or concave at the base; species of South America..... Sect. 3. MONTANAE
- BB. Corolla infundibuliform..... Sect. 5. LAXAE
- AA. Corolla-tube more or less gibbous or arcuate; squamellae as many as the calyx-lobes and opposite them, frequently deeply lacerate (see also *M. funiformis*); upper surface of leaves glandular along the midrib (see also *M. congesta* and *M. callista*)..... Subgen. II. EXOTHOSTEMON

Subgen. I. EUMANDEVILLA Woodson, n. subgen.

Corolla-tube straight, not gibbous or arcuate; squamellae predominantly numerous, in groups alternate with the calyx-lobes, or indefinitely and uniformly distributed (or solitary and opposite the calyx-lobes in *M. funiformis*); upper surface of leaves bearing few to several glandular emergences clustered at the base of the midrib, or eglandular in certain species (sparsely glandular along the midrib in *M. congesta* and *M. callista*). Sects. 1-5.

Sect. 1. TUBIFLORAE Woodson. Corolla salverform or tubular-salverform; nectaries 5, equaling or somewhat surpassing the ovary; anthers oblong to oblong-lanceolate, conspicuously auriculate; lianas of Mexico and Central America. Spp. 1-8.

KEY TO THE SPECIES

- a. Corolla strictly salverform, the limb conspicuous and definitely reflexed or spreading.
- b. Stamens inserted near the orifice of the corolla-tube, the anthers with truncate auricles.
- c. Calyx-lobes uniform or essentially so, relatively inconspicuous, much shorter than the corolla-tube.
- d. Inflorescence not secund; leaves lanceolate to oblong-lanceolate.
 - e. Corolla-lobes obovate, about $\frac{1}{4}$ as long as the tube; leaves pubescent, at least beneath..... 1. *M. tubiflora*
 - ee. Corolla-lobes oblong-lanceolate, about $\frac{3}{4}$ as long as the tube; leaves glabrous..... 2. *M. acutiloba*
- dd. Inflorescence secund; leaves broadly ovate to ovate-oblong..... 3. *M. Donnell-Smithii*

- cc. Calyx-lobes unequal and very conspicuous, about half as long as the corolla-tube..... 4. *M. platyacyla*
- bb. Stamens inserted about midway within the corolla-tube, the anthers with rounded auricles.
 - c. Inflorescence neither secund nor subscorpioid; leaves lanceolate, glabrous..... 5. *M. Rosana*
 - cc. Inflorescence secund and subscorpioid; leaves ovate to ovate-lanceolate, pubescent to glabrate above..... 6. *M. subscorpioides*
 - aa. Corolla tubular-salverform, the limb relatively inconspicuous, erect or nearly so, not reflexed or spreading.
 - b. Inflorescence typically racemose, about as long as the subtending leaves, or somewhat longer; calyx-lobes 0.2-0.3 cm. long, acute to broadly acuminate..... 7. *M. Syring*
 - bb. Inflorescence corymbose or subumbellate, shorter than the subtending leaves; calyx-lobes 0.4-0.6 cm. long, long-acuminate to subulate.... 8. *M. sertuligera*

1. ***Mandevilla tubiflora* (Mart. & Gal.) Woodson**, Ann. Mo. Bot. Gard. 19: 52. 1932.

Echites tubiflora Mart. & Gal. Bull. Acad. Roy. Brux. 11: 358. 1844; Miers, Apoc. So. Am. 206. 1878.

Amblyanthera tubiflora (Mart. & Gal.) Muell.-Arg. Linnaea 30: 423. 1860.

Echites Cobanensis Donn. Sm. Bot. Gaz. 40: 6. 1905.

Suffruticose lianas; stems terete, relatively slender, minutely puberulent when young, eventually becoming glabrate; leaves opposite, petiolate, lanceolate to oblong-lanceolate, acuminate, obscurely cordate, 4-10 cm. long, 0.75-4.0 cm. broad, membranaceous, upper surface minutely puberulent to glabrate, glandular at the base of the midrib, lower surface densely tomentulose; petiole 0.4-1.0 cm. long; nodal appendages inconspicuous; inflorescence lateral, or occasionally subterminal, simply racemose, about as long as the subtending leaves, bearing 8-20 yellowish flowers; pedicels 0.75-1.0 cm. long, the subtending bracts lanceolate to filiform, about 0.2 cm. long; calyx-lobes ovate to ovate-lanceolate, acute to acuminate, 0.1-0.2 cm. long, scarious, minutely puberulent to glabrate, the squamellae in alternate groups of 5-6, or uniformly distributed; corolla salverform, glabrous without, the tube straight, 1.0-1.5 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely obovate, 0.25-0.35 cm. long, spreading; stamens inserted near the orifice of the corolla-tube, the anthers 0.3 cm. long, basal auricles

truncate; ovary ovoid, glabrous, about 0.075 cm. long; stigma 0.25 cm. long; nectaries 5, compressed-oblongoid, as long as the ovary or somewhat longer; follicles unknown.

MEXICO: VERA CRUZ: Zazuapan and vicinity, Nov., 1906, *Purpus* 1935 (B, FM, G, MBG, NY, US); hillsides, Zazuapan, July, 1926, *Purpus* 10790 (US); Mirador til Huatusco, Sept., 1841, *Liebmamn* 11978 (C); Mirador, Nov., 1841, *Liebmamn* 11960 (C); same locality, Oct., 1841, *Liebmamn* 11959 (C); OAXACA: near Xalapa, alt. 3000 ft., Oct., 1841, *Galeotti* 1579 (K, TYPE, MBG, photograph and analytical drawings); YUCATAN: exact locality and date lacking, *Gaumer* 23969 (FM, US); DATA INCOMPLETE: *Ghiesbreght* 148 (B, BB).

GUATEMALA: ALTA VERAPAZ: Coban, alt. 1400 m., Aug., 1904, *Tuerckheim* 8709 (US); in Gebüschen windend, same locality, June, 1907, *Tuerckheim* II 1516 (Bx, G, NY, US, V); same locality, July, 1912, *Tuerckheim* 2448 (US); Samac, alt. 4000 ft., July 26, 1920, H. Johnson 410 (US).

Until the present time, Martens & Galeotti's specific name has been wrongly applied to the plants correctly referable to *M. Syringa* and *M. sertuligera*, as a result of insufficiency in the original description and inaccessibility of authentic specimens. In the course of this study, however, the type specimen of *E. tubiflora*, or a duplicate of the type (*Galeotti* 1579), was found among the collection of undetermined Apocynaceae in the herbarium of the Royal Botanic Gardens, Kew, which fortunately gives a definite status to the species. This would appear to be the only surviving specimen of the collection, as it was not found in the herbarium of the Jardin Botanique de l'Etat, Brussels, with the bulk of Galeotti's specimens.

2. *Mandevilla acutiloba* (A. DC.) Woodson, Ann. Mo. Bot. Gard. 19: 54. 1932.

Echites acutiloba A. DC. in DC. Prodr. 8: 451. 1844; Miers, Apoc. So. Am. 198. 1878.

Amblyanthera acutiloba (A. DC.) Muell.-Arg. Linnaea 30: 426. 1860.

Suffruticose lianas; stems terete, relatively slender, glabrous; leaves opposite, petiolate, lanceolate to broadly elliptic-lanceolate, acuminate, obscurely cordate, 5–8 cm. long, 1.5–3.0 cm. broad, membranaceous, either surface glabrous, the upper glandular at the base of the midrib; petiole 0.75–2.0 cm. long; nodal appendages minute; inflorescence lateral, simply racemose, about as long as the subtending leaves, bearing 7–12 yellowish flowers; pedicels

1.75–2.0 cm. long, glabrous; bracts lanceolate to linear-lanceolate, 0.2–0.5 cm. long; calyx-lobes lanceolate to oblong-lanceolate, acuminate, 0.25–0.5 cm. long, scarious, glabrous, the squamellae in alternate groups of 4–6, or uniformly distributed; corolla salverform, glabrous without, the tube straight, 1.5–1.75 cm. long, about 0.2 cm. in diameter at the base, the lobes obliquely oblong-lanceolate, acuminate, about 0.5 cm. long, spreading; stamens inserted near the orifice of the corolla-tube, the anthers 0.4 cm. long, basal auricles truncate; ovary ovoid, about 0.1 cm. long, glabrous; stigma 0.2 cm. long; nectaries 5, compressed-oblongoid, equalling or somewhat surpassing the ovary; follicles unknown.

MEXICO: CHIAPAS: near Tumbala, alt. 4000–5500 ft., Oct. 20, 1895, Nelson 3337 (US); DATA INCOMPLETE: *Pavon* s. n. (BB, TYPE, MBG, photograph and analytical drawings).

The Nelson specimen does not quite agree with that of Pavon. The leaves are somewhat more attenuate, the calyx-lobes are shorter, the corolla-lobes are more nearly oblong, and the nectaries equal the ovary in the former, whereas they somewhat surpass the ovary in the latter. In time, the specimens may be interpreted as representing distinct species, but such a view must be reinforced by a study of additional specimens to establish the range of variability of the plants.

3. *Mandevilla Donnell-Smithii* Woodson, Ann. Mo. Bot. Gard. 19: 54. 1932.

Suffruticose lianas; stems terete, relatively slender, puberulent; leaves opposite, petiolate, ovate to ovate-oblong, apex acute to acuminate, rarely somewhat obtuse, base abruptly rounded, cordate, 4–10 cm. long, 2–8 cm. broad, membranaceous, upper surface hirtellous, glandular at the base of the midrib, lower surface densely tomentulose; petiole 0.75–2.5 cm. long; nodal appendages minute; inflorescence lateral or occasionally sub-terminal, simply racemose, equalling or somewhat exceeding the subtending leaves, bearing 10–25 secund, yellowish flowers; pedicels 0.5–0.75 cm. long; bracts narrowly lanceolate to flagelliform, 0.2–0.4 cm. long, scarious; calyx-lobes ovate to ovate-lanceolate, acute to acuminate, 0.3–0.4 cm. long, scarious,

minutely puberulent, the squamellae very numerous, indefinitely distributed; corolla salverform, glabrous without, the tube straight, 1.25–1.5 cm. long, about 0.15 cm. in diameter at the base, the lobes obliquely obovate, 0.25–0.4 cm. long, spreading; stamens inserted near the orifice of the corolla-tube, the anthers 0.3 cm. long, basal auricles truncate; ovary ovoid, about 0.1 cm. long, glabrous; stigma 0.2 cm. long; nectaries 5, compressed-ovoid, equalling or slightly surpassing the ovary; follicles unknown.

GUATEMALA: BAJA VERAPAZ: Cuestas de Cachil, alt. 1200–1600 m., near Salama, April 21, 1905, Pittier 144 (US); Santa Rosa, alt. 5000 pp., im Walde, July, 1887, Tuerckheim 1275 (US); SACATEPEQUEZ: Santiago, alt. 6500 pp., 1891, Gomez 777 (K, US); SANTA ROSA: Cerro Gordo, alt. 3500 pp., Aug., 1892, Heyde & Lux 3993 (B, G, TYPE, K, NY, US, MBC, photograph and analytical drawings); DATA INCOMPLETE: Heyde 749 (US); Heyde 152 (US).

Superficially, this species may be distinguished from *M. tubiflora*, with which it is most likely to be confused, by its secund inflorescence and broader foliage. In addition, the inflorescence of the former is much more compact than that of the latter, and is usually somewhat more floriferous.

4. *Mandevilla platyactyla* Woodson, Ann. Mo. Bot. Gard. 19: 55. 1932.

Suffruticose lianas; stems relatively slender, terete, densely tomentose when young, eventually becoming glabrate; leaves opposite, shortly petiolate, ovate to oblong-obovate, apex acute to acuminate, base obscurely cordate, 5–10 cm. long, 2–5 cm. broad, membranaceous, upper surface densely hirtellous to glabrate, glandular at the base of the midrib, lower surface tomentose; petiole 0.2–0.4 cm. long; nodal appendages inconspicuous; inflorescence lateral or occasionally subterminal, simply racemose, somewhat shorter than the subtending leaves, bearing 10–25 yellowish flowers; pedicels 0.8–1.0 cm. long; bracts ovate to ovate-oblong, 0.3–0.6 cm. long; calyx-lobes ovate-oblong, abruptly acute to obtuse, 0.6–0.8 cm. long, minutely tomentulose to glabrate, the squamellae indefinitely distributed; corolla salverform, glabrous without, the tube straight, 1.25–1.5 cm. long, about 0.25 cm. in diameter at the base, the lobes obliquely obovate, 0.4–0.5 cm. long, spreading; stamens inserted near the

orifice of the corolla-tube, the anthers 0.5 cm. long, basal auricles truncate; ovary ovoid, about 0.1 cm. long, puberulent; stigma 0.2 cm. long; nectaries 5, compressed-ovoid, about equalling the ovary; follicles falcate, continuous, about 25 cm. long, glabrate; seeds 1 cm. long, the pale tawny coma about 2 cm. long.

MEXICO: OAXACA: entre El Ladron y Plan de Minas, Juquila, alt. 1500 m., Dec. 28, 1921, Conzatti 4541 (US); Tolaga, June, 1842, Liebmann 11986 (C, TYPE, MBG, photograph and analytical drawings).

M. platydactyla is unique among its neighboring species because of its peculiar laminate calyx-lobes, recalling the appearance of the foliaceous calyx of the Candallean genus *Laseguea* as misinterpreted by Miers. From its immediate relatives the species also differs in the deeper sinuation of the anther auricles.

5. *Mandevilla Rosana* (Donn. Sm.) Woodson, Ann. Mo. Bot. Gard. 19: 56. 1932.

Echites Rosana Donn. Sm. Bot. Gaz. 40: 6. 1905.

Suffruticose lianas; stems terete, relatively slender, glabrous, or sparsely and minutely puberulent when very young; leaves opposite, petiolate, lanceolate to narrowly ovate-lanceolate, acuminate, abruptly and obscurely cordate, 6-12 cm. long, 1.5-3.0 cm. broad, firmly membranaceous, glabrous, upper surface glandular at the base of the midrib; petiole 0.3-0.5 cm. long; nodal appendages very inconspicuous; inflorescence lateral or subterminal, simply racemose, equalling or slightly surpassing the subtending leaves, bearing 6-15 yellowish flowers; pedicels 0.7-1.0 cm. long; bracts narrowly lanceolate to linear, 0.5-0.7 cm. long; calyx-lobes ovate-lanceolate, 0.3-0.4 cm. long, glabrous, the squamellae in alternate groups of 5-6; corolla salverform, glabrous without, the tube straight, 1.5 cm. long, about 0.2 cm. in diameter at the base, the lobes obliquely obovate-oblong, 0.6-0.7 cm. long, spreading; stamens inserted about midway within the corolla-tube, the anthers 0.4 cm. long, auricles rounded; ovary ovoid, 0.1 cm. long, glabrous; stigma 0.4 cm. long; nectaries 5, compressed-oblongoid, equalling the ovary; follicles unknown.

GUATEMALA: SANTA ROSA: Buena Vista, alt. 1000 m., April, 1893, Heyde & Lux 4540 (B, G, K, US, TYPE, MBG, photograph and analytical drawings).

Known only from the type locality. Abundant differences separate it from the following, however, as the key to species indicates.

6. **Mandevilla subscorpioidea** Woodson, Ann. Mo. Bot. Gard. 19: 56. 1932.

Suffruticose lianas; stems terete, relatively slender, hirtellous, eventually becoming glabrate; leaves opposite, petiolate, ovate to ovate-lanceolate, apex acuminate, base abruptly and narrowly cordate, 4–14 cm. long, 1.5–7.0 cm. broad, membranaceous, above hirtellous or hispidulous to glabrate, glandular at the base of the midrib, beneath densely tomentulose; petiole 0.4–1.0 cm. long; nodal appendages inconspicuous; inflorescence lateral, simply racemose, equalling or greatly surpassing the subtending leaves, bearing 15–40 secund, yellowish or orange-tinted flowers; pedicels 0.75–1.0 cm. long; bracts linear-lanceolate, 0.5–0.75 cm. long, scarious; calyx-lobes lanceolate, acuminate, 0.4 cm. long, scarious, sparsely hirtellous to glabrate, the squamellae indefinitely distributed; corolla salverform, glabrous without, the tube straight, 1.5–2.0 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely obovate, 0.4–0.5 cm. long, spreading; stamens inserted about midway within the corolla-tube, the anthers 0.4 cm. long, the auricles rounded; ovary ovoid, about 0.1 cm. long, glabrous; stigma 0.4 cm. long; nectaries 5, compressed-oblongoid, equalling or slightly surpassing the ovary; follicles unknown.

MEXICO: CHIAPAS: Cerro de Boqueron, June, 1914, *Purpus 7274* (BM, G, MBG, TYPE, US).

GUATEMALA: ALTA VERAPAZ: im Gebüschen windend, Coban, alt. 1350 m., June, 1907, *Tuerckheim 1829* (FM, G, NY, US).

These two specimens are not identical, and may be found to represent distinct species or varieties when additional material is available for study. *Purpus 7274* has somewhat longer, narrower calyx-lobes, which are sparsely pilose or hirtellous, the bracts are longer, as are also the leaves, and the floral buds are relatively blunt. *Tuerckheim 1829* has shorter calyx-lobes which are merely somewhat ciliate, also shorter bracts and leaves, and the floral buds are more sharp than in the preceding.

7. **Mandevilla Syrinx** Woodson, Ann. Mo. Bot. Gard. 19: 53. 1932.

Suffruticose lianas; stems terete, relatively slender, puberulent, eventually becoming glabrate; leaves opposite, shortly petiolate, elliptic-ovate to oblong-lanceolate, shortly acuminate, narrowly cordate, 5–14 cm. long, 1.5–8.0 cm. broad, above minutely hispidulous to glabrate, glandular at the base of the midrib, beneath finely tomentulose or puberulent to glabrate; petiole 0.5–1.0 cm. long; nodal appendages very inconspicuous; inflorescence lateral or subterminal, simply racemose, equalling or somewhat surpassing the subtending leaves, bearing 15–60 congested, yellowish flowers; pedicels 0.3–0.4 cm. long; bracts ovate-lanceolate, 0.2–0.3 cm. long, scarious; calyx-lobes ovate-trigonal, acute to broadly acuminate, 0.2–0.3 cm. long, scarious, glabrous or minutely puberulent-papillate, the squamellae indefinitely distributed; corolla tubular-salverform, glabrous without, the tube straight, 0.5–0.75 cm. long, about 0.3–0.4 cm. in diameter at the base, the lobes obliquely ovate, about 0.4 cm. long, erect or nearly so; stamens inserted about midway within the corolla-tube, the anthers 0.4 cm. long, auricles truncate; ovary ovoid, about 0.2 cm. long, glabrous; stigma 0.3–0.4 cm. long; nectaries 5, compressed-oblongoid, equalling or slightly surpassing the ovary; follicles falcate or somewhat divaricate, continuous, 15–25 cm. long, glabrous; seeds about 0.75 cm. long, the pale yellowish coma about 1.5 cm. long.

MEXICO: GUANAJUATO: Piesa de la Olla a Guanajuato, May, 1897, *Duges* 90 (G, US); Guanajuato, 1880, *Duges* s. n. (G); JALISCO: barranca, near Guadalajara, date lacking, *Palmer* 98 (G, US); barranca of Tequila, Oct. 8, 1893, *Pringle* 5422 (B, G, MBG, TYPE); MORELOS: lava-beds, near Cuernavaca, alt. 5000 ft., June 23–Sept. 15, 1896, *Pringle* 6329 (B, BB, BM, Bx, DL, G, K, MBG, NY, S, US, V).

8. *Mandevilla sertuligera* Woodson, Ann. Mo. Bot. Gard. 19: 383. 1932.

Suffruticose lianas; stems terete, relatively slender, minutely hispidulous to puberulent, eventually becoming glabrate; leaves opposite, petiolate, elliptic-ovate, apex abruptly acuminate, base obscurely cordate, 6–8 cm. long, 3.0–3.5 cm. broad, membranaceous, above hispidulous to strigillose, glandular at the base of the midrib, beneath densely lanate-tomentose; petiole 0.75–1.25 cm. long; nodal appendages very inconspicuous; inflorescence lateral or subterminal, corymbose to subumbellate, about half

as long as the subtending leaves, bearing 10–45 congested, yellowish flowers; pedicels 0.3–0.4 cm. long; bracts linear, about as long as the pedicels; calyx-lobes narrowly lanceolate, acuminate to subulate, 0.4–0.6 cm. long, scarious, minutely pilosulose, the squamellae indefinitely distributed; corolla tubular-silverform, glabrous without, the tube straight, 0.75 cm. long, about 0.3 cm. in diameter at the base, the lobes obliquely ovate, 0.3–0.4 cm. long, erect or nearly so; stamens inserted about midway within the corolla-tube, the anthers 0.4 cm. long, auricles obtuse; ovary ovoid, about 0.15 cm. long, puberulent-papillate; stigma 0.4 cm. long; nectaries 5, compressed-oblongoid, slightly surpassing the ovary; follicles unknown.

MEXICO: MICHOACAN: rocky hills near Coru Station, alt. 6000 ft., Jan. 23, 1907, Pringle 13890 (G, US, TYPE, MBG, photograph and analytical drawings); same locality, Oct. 15, 1904, Pringle 13106 (B, C, G, K, US); MORELOS: near Cuernavaca, July 10, 1898, Pringle s. n. (C); OAXACA: exact locality lacking, alt. 6000 pp., date lacking, Galeotti 1604 (DL).

This species, together with *M. Syrinx*, forms a distinctive element in the Mexican and Central American representation of the genus which strikingly resembles *M. brachyloba*, *M. cercophylla*, and the closely related *M. erecta* and *M. Pentlandiana* of South America, in the inconspicuous, erect corolla-lobes. The latter four species, however, differ from the preceding in the truncate anthers, which serve to distinguish § *Montanae* from the superficially similar § *Tubiflorae*. Several of the specimens cited for both *M. Syrinx* and *M. sertuligera* exhibit slight differences in the quality of the indument which may eventually lead to varietal segregation.

Sect. 2. TOROSAE Woodson. Corolla silverform; nectaries 5, shorter than the ovary (or barely equalling them in *M. apocynifolia*); anthers broadly ovate-oblong to oblong-lanceolate, conspicuously auriculate; low twiners of Jamaica and suffrutescent herbs of Mexico. *Spp. 9–13.*

KEY TO THE SPECIES

- a. Racemes subcorymbose; nectaries shorter than the ovary.
- b. Plants twining or trailing (occasionally suberect in 10); stamens inserted about midway within the corolla-tube.
- c. Plants twining, infrequently trailing; leaves elliptic; corolla-tube 0.4–0.6 cm. long; follicles moniliform; plants of Jamaica and Yucatan.....9. *M. torosa*

- cc. Plants trailing or suberect, infrequently somewhat twining; leaves oblanceolate or narrowly spatulate; corolla-tube 0.7-0.9 cm. long; follicles essentially continuous; plants of southeastern Mexico.
 - 10. *M. Karwinskii*
- bb. Plants erect or essentially so; stamens inserted above the middle of the corolla-tube.
 - c. Corolla-lobes obliquely oblong-ovate, shorter than the tube; leaves 6-15 cm. long, minutely and generally pilose beneath. 11. *M. foliosa*
 - cc. Corolla-lobes obliquely obovate, about as long as the tube; leaves 2-5 cm. long, minutely puberulent along the midrib beneath. 12. *M. mexicana*
 - aa. Racemes relatively elongate; nectaries about as long as the ovary.
 - 13. *M. apocynifolia*

9. *Mandevilla torosa* (Jacq.) Woodson, Ann. Mo. Bot. Gard 19: 64. 1932.

Echites torosa Jacq. Enum. Syst. Pl. Carib. 13. 1760; *ibid.* Stirp. Am. 1: 33. pl. 27. 1763; A. DC. in DC. Prodr. 8: 449. 1844; Griseb. Fl. Br. W. Ind. 413. 1861.
Echites torulosa L. Sp. Pl. ed. 2. 307. 1762; Griseb. loc. cit. 414. 1861.

Echites torosa Jacq. var. *Brownii* A. DC. loc. cit. 1844.
Amblyanthera torosa (Jacq.) Muell.-Arg. Linnaea 30: 446. 1860.
Echites Brownii (A. DC.) Muell.-Arg. loc. cit. 1860; Griseb. loc. cit. 414. 1861.

Mesechites torulosa (L.) Miers, Apoc. So. Am. 229. 1878.
Mesechites Brownii (A. DC.) Miers, loc. cit. 232. 1878.

Suffrutescent twiners, occasionally somewhat trailing; stems terete, relatively slender, puberulent when young, usually becoming glabrate; leaves opposite, shortly petiolate, elliptic, apex acute to acuminate, base gradually narrowed and obscurely cordate, 2-7 cm. long, 0.75-3.0 cm. broad, firmly membranaceous to subcoriaceous, usually glabrous, infrequently minutely pilose, above sparsely glandular at the base of the midrib; petiole 0.15-0.4 cm. long; nodal appendages minute; inflorescence lateral, corymbose or subcorymbose, about as long as the subtending leaves, bearing 3-12 white or cream-colored flowers; pedicels 0.75-1.0 cm. long; bracts lanceolate, 0.1-0.4 cm. long, scarious; calyx-lobes lanceolate-trigonal, acuminate, 0.15-0.2 cm. long, scarious, glabrous, the squamellae in alternate groups of 4-5; corolla salverform, glabrous without, the tube straight, 0.4-0.6

cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely oblong-obovate, 0.4–0.5 cm. long, spreading; stamens inserted about midway within the corolla-tube, the anthers 0.2 cm. long, glabrous or very minutely papillate, broadly auriculate; ovary ovoid, about 0.05 cm. long, glabrous; stigma 0.125 cm. long; nectaries 5, about half as long as the ovary; follicles usually somewhat falcate, conspicuously moniliform, 9–20 cm. long, glabrous or rarely minutely puberulent-papillate; seeds about 1 cm. long, the pale yellowish coma about 2 cm. long.

JAMAICA: rocky hillside, Mandeville to Lincoln, Parish of Manchester, Sept. 3–7, 1908, Britton 3127 (NY); roadside bank, Mandeville and vicinity, Aug. 29, 1907, Britton 1008 (NY); Lucea, Jan. 10, 1891, Rothrock 146 (FM); Blue Mountains, alt. 3750 ft., Dec. 12, 1890, Rothrock 369 (FM); Keith Hall, alt. 2000 ft., Aug. 30, 1900, Thompson 7975 (FM, NY); waysides, Cinchona, alt. 5000 ft., July 26, 1903, Nichols 162 (FM, MBG, US); Lucea, Jan. 3, 1891, Hitchcock s. n. (MBG); Constant Spring, Dec. 10, 1890, Hitchcock s. n. (MBG); along road, Orange River Valley, near Montego Bay, March 29–30, 1920, Maxon & Killip 1675 (G, US); Bog Walk, May 4–5, 1910, Crawford 821 (PA); Blue Mt. Peak, Dec. 13, 1890, Hitchcock s. n. (MBG); Bethlehem, St. Elizabeth, Sept. 1901, Harris 8285 (B); Hope Estate, Nov., 1849, Alexander s. n. (K); Halberstadt, Port Royal Mts., alt. 2400 ft., Febr., 1924, Norman 199 (BM); between Gordon Town and Guara Bridge, Oct. 2, 1901, Fawcett s. n. (BM); seacoast, climbing on fences, near Falmouth, Febr. 18, 1893, Harris 7237 (BM); Long Hill, road to Bethlehem, Santa Cruz Mts., May 7, 1915, Perkins 276 (B); DATA INCOMPLETE: Alexander s. n. (K, NY); Hart s. n. (NY); Purdie s. n. (K); Andrews s. n. (K); Houston s. n. (BM); Cumming 51 (BM); Swartz s. n. (S).

MEXICO: YUCATAN: ruins of Uxmal, Sept. 16, 1865, Schott 673 (BM, FM); Chichulub, Sept., 1916, Gaumer 23423 (C, FM, G, MBG, S); common in bushland about Izamal, Aug., year lacking, Gaumer 883 (BM, C, FM, MBG, S); Chichankanab, date lacking, Gaumer 2013 (FM, G); DATA INCOMPLETE: 1895, Gaumer 881 (FM, G, MBG, US).

Although the specimens cited from Jamaica are very stable, and show infrequent and inconsequential variations, the specimens from Yucatan are much less uniform, particularly in regard to the presence of an indument.

10. *Mandevilla Karwinskii* (Muell.-Arg.) Hemsl. Biol. Centr.-Am. Bot. 2: 316. 1882.

Amblyanthera Karwinskii Muell.-Arg. Linnaea 30: 426. 1860.

Echites Karwinskii (Muell.-Arg.) Miers, Apoc. So. Am. 206. 1878.

Echites (*Euechites*) *Coulteri* S. Wats. Proc. Am. Acad. 18: 113. 1883.

Suberect or trailing, suffrutescent herbs, infrequently somewhat twining; stems terete, relatively slender, minutely puberulent when young, becoming glabrate; leaves opposite, shortly petiolate, oblanceolate to narrowly spatulate, apex obtuse to broadly acute, base gradually narrowed and somewhat decurrent, rarely obscurely cordate, 1.5–5.0 cm. long, 0.5–2.0 cm. broad, membranaceous, finely puberulent, particularly beneath, above sparsely glandular at the base of the midrib; petiole 0.2–0.3 cm. long; nodal appendages minute; inflorescence lateral, subcorymbose, simple, about as long as the subtending leaves, bearing 3–7 white or cream-colored flowers; pedicels 0.4–0.6 cm. long; bracts lanceolate, 0.2–0.5 cm. long, scarious; calyx-lobes lanceolate-trigonal, acute to acuminate, 0.3–0.4 cm. long, scarious, glabrous, the squamellae in alternate groups of 4–6; corolla salverform, glabrous without, the tube straight, 0.7–0.9 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely obovate, 0.7–0.8 cm. long, spreading; stamens inserted about midway within the corolla-tube, the anthers 0.2 cm. long, glabrous, obscurely cordate; ovary oblong-ovoid, about 0.15 cm. long, glabrous; stigma 0.2 cm. long; nectaries 5, compressed-ovoid, about half as long as the ovary; follicles falcate or somewhat divaricate, essentially continuous, glabrous or rarely somewhat puberulent, 6–10 cm. long; seeds about 1 cm. long, the pale yellowish coma about 1.5 cm. long.

MEXICO: COAHUILA: canyons and elevated portion of Sierra Madre, 12–14 leagues south of Saltillo, July 25–Aug. 1, 1880, E. Palmer 805 (BB, G, K, PA, US); San Lorenzo Canyon, 6 mi. southeast of Saltillo, July 9, 1905, E. Palmer 697 (FM, G, MBG, NY, US); Saltillo and vicinity, Nov. 2–5, 1898, E. Palmer 571 (US); Sierra de Parras, Oct., 1910, Purpus 4613 (B, BM, FM, G, MBG, US); SAN LUIS POTOSI: en route from San Louis Potosi to Tampico, Dec. 1878–Febr. 1879, E. Palmer 1127 (BM, G, K); Alvarez, May 19–22, 1905, E. Palmer 605 (FM, G, NY, US); Minas de San Rafael, May, 1911, Purpus 5213 (FM, MBG, NY, US); HIDALGO: near Ixmiquilpan, 1905, Rose Painter & Rose 9055 (US); same locality, July–Sept., 1905, Purpus 1398 (G); Sierra de la Mesa, July 21–Aug. 1, 1905, Rose Painter & Rose 9129 (US); DATA INCOMPLETE: Coulter 957 (Camb., G, K, NY).

11. *Mandevilla foliosa* (Muell.-Arg.) Hemsl. Biol. Centr.-Am. Bot. 2: 316. 1882.

Amblyanthera foliosa Muell.-Arg. Linnaea 30: 427. 1860.

Laseguea foliosa (Muell.-Arg.) Miers, Apoc. So. Am. 253. 1878.

Trachelospermum stans A. Gray, Proc. Am. Acad. 21: 394.
1886.

Secondatia stans (A. Gray) Standl. Contr. U. S. Nat. Herb.
23: 1165. 1924.

Erect or ascending, suffrutescent herbs; stems terete, relatively slender, densely puberulent when young, becoming glabrate; leaves opposite, petiolate, ovate-elliptic, apex acute to acuminate, base gradually narrowed and obscurely cordate, 6–15 cm. long, 2–7 cm. broad, membranaceous, above minutely pilose to glabrate, sparsely glandular at the base of the midrib, beneath minutely and generally pilose; petiole 0.5–1.0 cm. long; nodal appendages minute; inflorescence lateral, subcorymbose, simple, usually much shorter than the leaves, bearing 3–12 whitish or cream-colored flowers; pedicels 0.5–1.0 cm. long; bracts lanceolate, 0.3–1.0 cm. long, scarious; calyx-lobes lanceolate-trigonal, acuminate, 0.4–0.6 cm. long, scarious, glabrous; corolla salverform, glabrous without, the tube straight, 1.0–1.5 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely oblong-obovate, 0.75–1.0 cm. long, spreading; stamens inserted above midway within the corolla-tube, the anthers 0.3 cm. long, glabrous, broadly auriculate; ovary ovoid, about 0.2 cm. long, glabrous; stigma 0.2 cm. long; nectaries 5, somewhat shorter than the ovary; follicles falcate, articulated or somewhat moniliform, 8–12 cm. long, minutely puberulent to glabrate; seeds about 1 cm. long, the pale yellowish coma about 2 cm. long.

MEXICO: CHIHUAHUA: rocky hills near Chihuahua, July 24, 1885, Pringle 640 (AA, B, Bx, MBG, NY, US); canyons, mountains near Chihuahua, July 24, 1886, Pringle 701 (B, BM, Bx, MBG, NY, US); SINALOA: La Petaca, Concordia, alt. 1500 m., Dec., 1915, Delesa 1653 (US); DURANGO: Inde, alt. 2000 m., June, 1927, Reko 5166 (US); Tobar, May 28–31, 1906, E. Palmer 238 (G, MBG, NY, US); Santiago Papasquiaro, Apr.–Aug., 1896, E. Palmer 395 (B, FM, G, MBG, NY, US); Pipasaniaro [?], Aug. 7, 1898, Nelson 4658 (G, MBG, US); JALISCO: Chapala, Nov. 1886, E. Palmer 724 (G, US); GUANAJUATO: Montes de Obrajuelo, Oct. 12, 1913, Salazar s. n. (US); exact locality lacking, 1880, Duges s. n. (G); QUERETARO: Queretaro, alt. 1850 m., 1910–13, Aguiel 10408 (FM, G, US); rocky hillside, near San Juan del Rio, Aug. 17, 1905, Rose Painter & Rose 9510 (NY, US); del Ciervo a Cadereyta, Aug. 21, 1905, Altamirano 1639 (US); VERA CRUZ: Wartenburg, near Tantoyuca, Prov. Huasteca, 1858, Ervendberg 240 (G); MICHOACAN: Coronilla, près Morelia, Sept. 19, 1910, Arsene s. n. (FM); Monteleon, lava fields, alt. 5500 ft., Aug. 19, 1902, Pringle 11015 (B, G, MBG, NY, US); environs de Morelia, Loma del Zapote, alt. 1900 m., July 27, 1909, Arsene 2668 (B); MEXICO: umgebund de Stadt Mexico, 1920–21,

Reiche s. n. (B); MORELOS: vulkanischer Boden mit Waldresten, alt. 1450 m., Dec. 12, 1905, Endlich 1075 (B); DATA INCOMPLETE: Ehrenberg 1369 (B); Schiede 448, 483 (B).

12. *Mandevilla mexicana* (Muell.-Arg.) Woodson, Ann. Mo. Bot. Gard. 19: 65. 1932.

Amblyanthera mexicana Muell.-Arg. Linnaea 30: 424. 1860.

Echites mexicana (Muell.-Arg.) Miers, Apoc. So. Am. 205. 1878.

Echites Smithii Greenm. Proc. Am. Acad. 40: 29. 1904.

Erect or ascending, suffrutescent herbs; stems terete, relatively slender, minutely puberulent when young, becoming glabrate; leaves opposite, shortly petiolate, ovate-oblong to ovate-lanceolate, apex acute to obtuse, base rather gradually narrowed, obscurely cordate, 2–5 cm. long, 0.5–2.0 cm. broad, membranaceous, above glabrous, sparsely glandular at the base of the midrib, beneath minutely puberulent along the midrib; petiole 1.0–1.5 cm. long; nodal appendages minute; inflorescence lateral, subcorymbose, simple, about half as long as the subtending leaves, bearing 3–7 white or cream-colored flowers; pedicels 0.5–0.75 cm. long; bracts lanceolate, 0.15–0.3 cm. long, scarious; calyx-lobes lanceolate-trigonal, acuminate, 0.4–0.6 cm. long, scarious, glabrous, the squamellae in alternate groups of 4–6; corolla salverform, glabrous without, the tube straight, about 1 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely obovate, about as long as the tube, spreading; stamens inserted above midway within the corolla-tube, the anthers 0.3 cm. long, glabrous, broadly auriculate; ovary ovoid, about 0.1 cm. long, glabrous; stigma 0.25 cm. long; nectaries 5, about half as long as the ovary; follicles falcate, inconspicuously articulated, 8–10 cm. long, glabrous; seeds about 1 cm. long, the pale tawny coma about 2 cm. long.

MEXICO: MICHOACAN: Zapote, près Morelia, June 27, 1909, Arsène s. n. (BM); OAXACA: Saloma, alt. 6500 ft., Aug. 9, 1895, Smith 672 (G); Huauchilla to Nohixtlan, alt. 2000 ft., June, 1901, Conzatti & Gonzalez 1198 (B, G); Huachilla, distrito de Nohixtlan, June 19, 1907, Conzatti 1837 (FM, US); same locality, Oct. 15, 1921, Conzatti 4277 (US).

13. *Mandevilla apocynifolia* (A. Gray) Woodson, Ann. Mo. Bot. Gard. 19: 65. 1932.

Echites (Amblyanthera ?) apocynifolia A. Gray, Proc. Am. Acad. 22: 435. 1887.

Erect or ascending, suffrutescent herbs; stems terete, relatively slender, minutely puberulent when young, becoming glabrate; leaves opposite, shortly petiolate, ovate-oblong to ovate-lanceolate, apex acute to acuminate, base rather abruptly and obscurely cordate, 4–7 cm. long, 1.5–2.0 cm. broad, membranaceous, above glabrous, sparsely glandular at the base of the midrib, above minutely puberulent, particularly along the veins; petiole 0.2–0.3 cm. long; nodal appendages minute; inflorescence lateral, simply racemose, somewhat surpassing the subtending leaves, bearing 3–10 white or pale cream-colored flowers; pedicels 1.0–1.25 cm. long; bracts lanceolate, 0.2–0.4 cm. long; calyx-lobes lanceolate-trigonal, acuminate, 0.4–0.5 cm. long, scarious, glabrous, the squamellae indefinitely distributed; corolla salverform, glabrous without, the tube straight, 1.0–1.25 cm. long, about 0.15 cm. in diameter at the base, the lobes obliquely obovate, about as long as the tube, spreading; stamens inserted about midway within the corolla-tube, the anthers 0.3 cm. long, broadly cordate; ovary ovoid, about 0.15 cm. long, minutely papillate; stigma 0.15 cm. long; nectaries 5, about as long as the ovary; follicles falcate, articulated, 6–9 cm. long, minutely puberulent to glabrate; seeds 0.75 cm. long, the pale yellowish coma about 1.5 cm. long.

MEXICO: JALISCO: Rio Blanco, July, 1886, E. Palmer 734 (G, TYPE, MBG, photograph and analytical drawings); Rio Blanco, near Guadalajara, July 22, 1902, Pringle 11357 (G).

Sect. 3. MONTANAE Woodson. Corolla salverform or tubular-salverform; nectaries 2–5, shorter than the ovary, or obsolete; anthers narrowly oblong to oblong-lanceolate, truncate or merely somewhat emarginate or concave at the base, not definitely auriculate; lianas (erect or ascending, suffrutescent herbs in *M. erecta* and *M. pycnantha*) of South America. *Spp. 14–29.*

KEY TO THE SPECIES

- a. Nectaries 5.
- b. Corolla strictly salverform, the limb conspicuous and definitely reflexed or spreading.
- c. Lianas; inflorescence lateral.
- d. Squamellae in groups of several, alternate with the calyx-lobes or indefinitely distributed.

Reiche s. n. (B); MORELOS: vulkanischer Boden mit Waldresten, alt. 1450 m., Dec. 12, 1905, Endlich 1075 (B); DATA INCOMPLETE: Ehrenberg 1369 (B); Schiede 448, 493 (B).

12. *Mandevilla mexicana* (Muell.-Arg.) Woodson, Ann. Mo. Bot. Gard. 19: 65. 1932.

Amblyanthera mexicana Muell.-Arg. Linnaea 30: 424. 1860.

Echites mexicana (Muell.-Arg.) Miers, Apoc. So. Am. 205. 1878.

Echites Smithii Greenm. Proc. Am. Acad. 40: 29. 1904.

Erect or ascending, suffrutescent herbs; stems terete, relatively slender, minutely puberulent when young, becoming glabrate; leaves opposite, shortly petiolate, ovate-oblong to ovate-lanceolate, apex acute to obtuse, base rather gradually narrowed, obscurely cordate, 2–5 cm. long, 0.5–2.0 cm. broad, membranaceous, above glabrous, sparsely glandular at the base of the midrib, beneath minutely puberulent along the midrib; petiole 1.0–1.5 cm. long; nodal appendages minute; inflorescence lateral, subcorymbose, simple, about half as long as the subtending leaves, bearing 3–7 white or cream-colored flowers; pedicels 0.5–0.75 cm. long; bracts lanceolate, 0.15–0.3 cm. long, scarious; calyx-lobes lanceolate-trigonal, acuminate, 0.4–0.6 cm. long, scarious, glabrous, the squamellae in alternate groups of 4–6; corolla salverform, glabrous without, the tube straight, about 1 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely obovate, about as long as the tube, spreading; stamens inserted above midway within the corolla-tube, the anthers 0.3 cm. long, glabrous, broadly auriculate; ovary ovoid, about 0.1 cm. long, glabrous; stigma 0.25 cm. long; nectaries 5, about half as long as the ovary; follicles falcate, inconspicuously articulated, 8–10 cm. long, glabrous; seeds about 1 cm. long, the pale tawny coma about 2 cm. long.

MEXICO: MICHOACAN: Zapote, près Morelia, June 27, 1909, *Arsène s. n.* (BM); OAXACA: Saloma, alt. 6500 ft., Aug. 9, 1895, *Smith* 672 (G); Huauchilla to Nochixtlan, alt. 2000 ft., June, 1901, *Conzatti & Gonzalez* 1198 (B, G); Huachilla, distrito de Nochixtlan, June 19, 1907, *Conzatti* 1837 (FM, US); same locality, Oct. 15, 1921, *Conzatti* 4277 (US).

13. *Mandevilla apocynifolia* (A. Gray) Woodson, Ann. Mo. Bot. Gard. 19: 65. 1932.

Echites (Amblyanthera ?) apocynifolia A. Gray, Proc. Am. Acad. 22: 435. 1887.

Erect or ascending, suffrutescent herbs; stems terete, relatively slender, minutely puberulent when young, becoming glabrate; leaves opposite, shortly petiolate, ovate-oblong to ovate-lanceolate, apex acute to acuminate, base rather abruptly and obscurely cordate, 4–7 cm. long, 1.5–2.0 cm. broad, membranaceous, above glabrous, sparsely glandular at the base of the midrib, above minutely puberulent, particularly along the veins; petiole 0.2–0.3 cm. long; nodal appendages minute; inflorescence lateral, simply racemose, somewhat surpassing the subtending leaves, bearing 3–10 white or pale cream-colored flowers; pedicels 1.0–1.25 cm. long; bracts lanceolate, 0.2–0.4 cm. long; calyx-lobes lanceolate-trigonal, acuminate, 0.4–0.5 cm. long, scarious, glabrous, the squamellae indefinitely distributed; corolla salverform, glabrous without, the tube straight, 1.0–1.25 cm. long, about 0.15 cm. in diameter at the base, the lobes obliquely obovate, about as long as the tube, spreading; stamens inserted about midway within the corolla-tube, the anthers 0.3 cm. long, broadly cordate; ovary ovoid, about 0.15 cm. long, minutely papillate; stigma 0.15 cm. long; nectaries 5, about as long as the ovary; follicles falcate, articulated, 6–9 cm. long, minutely puberulent to glabrate; seeds 0.75 cm. long, the pale yellowish coma about 1.5 cm. long.

MEXICO: JALISCO: Rio Blanco, July, 1886, E. Palmer 734 (G, TYPE, MBG, photograph and analytical drawings); Rio Blanco, near Guadalajara, July 22, 1902, Pringle 11557 (G).

Sect. 3. MONTANAE Woodson. Corolla salverform or tubular-salverform; nectaries 2–5, shorter than the ovary, or obsolete; anthers narrowly oblong to oblong-lanceolate, truncate or merely somewhat emarginate or concave at the base, not definitely auriculate; lianas (erect or ascending, suffrutescent herbs in *M. erecta* and *M. pycnantha*) of South America. *Spp. 14–29.*

KEY TO THE SPECIES

- a. Nectaries 5.
- b. Corolla strictly salverform, the limb conspicuous and definitely reflexed or spreading.
- c. Lianas; inflorescence lateral.
- d. Squamellae in groups of several, alternate with the calyx-lobes or indefinitely distributed.

- e. Leaves definitely petiolate; calyx-lobes lanceolate to ovate-lanceolate.
- f. Limb $\frac{1}{4}$ to $\frac{1}{2}$ as long as the corolla-tube.
 - g. Corolla-tube about 1 cm. long, about twice as long as the limb..... 14. *M. scutifolia*
 - gg. Corolla-tube 1.5–2.5 cm. long, 3–4 times as long as the limb.
 - h. Plants glabrous or irregularly and minutely puberulent to glabrate; leaves obtuse to rounded at the base, not cordate; limb about $\frac{1}{4}$ as long as the corolla-tube..... 15. *M. callacalensis*
 - hh. Plants puberulent to hirtellous, rarely glabrate; leaves cordate; limb about $\frac{1}{3}$ as long as the corolla-tube..... 16. *M. montana*
 - ff. Limb more than $\frac{1}{2}$ as long as the corolla-tube.
 - g. Limb about $\frac{2}{3}$ as long as the tube; leaves ovate-lanceolate to ovate-oblong..... 17. *M. riparia*
 - gg. Limb as long as the tube or somewhat longer; leaves ovate to ovate-oblong..... 18. *M. Jamesonii*
- ee. Leaves sessile and amplexicaul; calyx-lobes ovate-subreniform.. 19. *M. subsessilis*
- dd. Squamellae solitary and alternate with the calyx-lobes... 20. *M. fragilis*
- cc. Erect or ascending, suffrutescent herbs or suffruticose undershrubs; inflorescence both terminal and lateral..... 21. *M. pycnantha*
- bb. Corolla tubular-salverform, the limb relatively inconspicuous, erect or essentially so.
 - c. Calyx-lobes much shorter than the corolla-tube.
 - d. Corolla glabrous without, not becoming black when desiccated; leaves obtuse or rounded at the base, not cordate... 22. *M. cercophylla*
 - dd. Corolla densely glandular-papillate without, becoming black when desiccated; leaves strongly cordate..... 23. *M. brachyloba*
 - cc. Calyx-lobes about as long as the corolla-tube or somewhat longer.
 - d. Lianas; leaves distinctly petiolate..... 24. *M. Pentlandiana*
 - dd. Erect or ascending suffrutescent herbs, or low suffrutescent undershrubs; leaves shortly petiolate to subsessile..... 25. *M. erica*
- aa. Nectaries fewer than 5, rarely obsolete.
 - b. Corolla-lobes obliquely oblong-elliptic; bracts conspicuous, subfolaceous; leaves sparsely glandular along the midrib above; nectaries evident..... 26. *M. congesta*
 - bb. Corolla-lobes broadly obovate; bracts inconspicuous, scarious; leaves glandular at the base of the midrib above; nectaries obsolete or extremely inconspicuous.
 - c. Corolla-tube longer than the limb..... 27. *M. Achrestogyna*
 - cc. Corolla-tube about as long as, or shorter than, the limb.
 - d. Leaves oblong to obovate-elliptic, 5–9 cm. long; corolla glabrous without, the tube about 0.75 cm. long..... 28. *M. bogotensis*
 - dd. Leaves ovate to broadly ovate-oblong, 15–20 cm. long; corolla densely puberulent-papillate without, the tube about 1.25 cm. long..... 29. *M. subpaniculata*

14. *Mandevilla scutifolia* Woodson, Ann. Mo. Bot. Gard. 19: 57. 1932.

Suffruticose lianas; stems terete, relatively slender, puberulent to glabrate; leaves opposite, petiolate, ovate to ovate-oblong, apex abruptly acute to acuminate, base abruptly and obscurely cordate, 2–5 cm. long, 1.5–3.0 cm. broad, membranaceous, above minutely and irregularly puberulent, glandular at the base of the midrib, beneath barbate in the axils of the midrib; petiole 1.0–1.25 cm. long; nodal appendages minute; inflorescence lateral, simply racemose, equaling or slightly surpassing the subtending leaves, bearing 3–10 yellowish flowers clustered near the end of a naked peduncle; pedicels 0.75–1.0 cm. long; bracts ovate-lanceolate, 0.2–0.3 cm. long, scarious; calyx-lobes ovate-lanceolate, acute to acuminate, 0.3–0.35 cm. long, scarious, minutely and densely puberulent, the squamellae in alternate groups of 3–4; corolla salverform, glabrous without, the tube straight, 1.0–1.25 cm. long, about 0.15 cm. in diameter at the base, the lobes obliquely obovate, 0.5–0.6 cm. long, widely spreading; stamens inserted about midway within the corolla-tube, the anthers 0.4 cm. long, truncate; ovary oblong-ovoid, about 0.1 cm. long, glabrous; stigma 0.3 cm. long; nectaries 5, compressed-ovoid, about half as long as the ovary; follicles unknown.

PERU: "Andes of Saragosa," date lacking, Lobb s. n. (K, TYPE, MBG, photograph and analytical drawings).

15. *Mandevilla callacatensis* Mgf. Notizblatt 9: 83. 1924.

Suffruticose lianas; stems terete, relatively slender, minutely puberulent-papillate to glabrate; leaves opposite, petiolate, broadly ovate- to oblong-elliptic, apex acute to abruptly acuminate, base obtuse or rounded, not cordate, 2.5–6.0 cm. long, 1.5–4.0 cm. broad, membranaceous, either surface minutely puberulent-papillate to glabrate, above sparsely glandular at the base of the midrib; petiole 1–2 cm. long; nodal appendages inconspicuous; inflorescence lateral, simply racemose, somewhat longer than the subtending leaves, bearing 5–12 yellowish flowers; pedicels 1.0–1.25 cm. long; bracts oblong-lanceolate, 0.15–0.2 cm. long; calyx-lobes lanceolate, acuminate, 0.2–0.3 cm. long, granulo-puberulent, the squamellae indefinitely distributed; corolla salverform, gla-

brous without, the tube straight, 2.0–2.5 cm. long, about 0.15 cm. in diameter at the base, the lobes obliquely ovate, 0.5 cm. long, reflexed or widely spreading; stamens inserted near the orifice of the corolla-tube, the anthers 0.5 cm. long, truncate; ovary oblong-ovoid, about 0.15 cm. long; stigma 0.25–0.3 cm. long; nectaries 5, compressed-ovoid, about half as long as the ovary; follicles essentially continuous, about 30 cm. long, glabrous; seeds about 0.75 cm. long, the brilliant tawny coma about 1.5 cm. long.

PERU: CAJAMARCA: Tal des Rio Chotano bei Callacate, zwischen Querocotillo und Cutervo, alt. 1400 m., June 1, 1915, Weberbauer 7128 (B, TYPE, FM, MBG, photograph and analytical drawings); Callacate, May, 1879, Jelski 375 (B, V).

16. *Mandevilla montana* (HBK.) Mgf. Notizblatt 9: 82. 1924.

Echites montana HBK. Nov. Gen. 3: 213. 1819; A. DC. in DC. Prodr. 8: 465. 1844; Miers, Apoc. So. Am. 199. 1878.

Suffruticose lianas; stems terete, relatively slender, densely puberulent to glabrate; leaves opposite, petiolate, ovate to ovate-oblong, apex acute to acuminate, base rather abruptly and broadly cordate, 3–9 cm. long, 1.5–5.0 cm. broad, membranaceous, above minutely hirtellous to glabrate, glandular at the base of the midrib, beneath minutely puberulent to tomentulose, particularly along the veins; petiole 0.75–3.0 cm. long; nodal appendages inconspicuous; inflorescence lateral, simply racemose, usually somewhat shorter than the subtending leaves, bearing 5–8 yellowish flowers; pedicels 0.5–1.0 cm. long; bracts lanceolate, 0.3–0.5 cm. long, scarios; calyx-lobes lanceolate, acuminate, 0.3–0.5 cm. long, scarios, minutely puberulent, the squamellae indefinitely distributed; corolla salverform, glabrous without, the tube straight, 1.75–2.0 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely obovate, 0.5–0.75 cm. long, spreading; stamens inserted near the orifice of the corolla-tube, the anthers 0.4–0.5 cm. long, truncate; ovary oblong-ovoid, about 0.15 cm. long, glabrous; stigma 0.3 cm. long; nectaries 5, compressed-oblongoid, about half as long as the ovary; follicles unknown.

COLOMBIA: CAUCA: Popayan, alt. 1600–2000 m., Jan.–March, year lacking, Lehmann 4801 (FM, G, K, S, US); lacinia alsis Andium Pastoensium in convallii fl. Guayan-

tana, alt. 850 m., Dec., year lacking, *Humboldt & Bonpland s. n.* (B, TYPE); TOLIMA: forest, Azufral to Moral, Old Quindio trail, alt. 1800–2300 m., Aug. 3, 1922, Killip & Hazen 9605 (NY).

17. *Mandevilla riparia* (HBK.) Woodson, Ann. Mo. Bot. Gard. 19: 58. 1932.

Echites riparia HBK. Nov. Gen. 3: 214. 1819; A. DC. in DC. Prodr. 8: 466. 1844; Miers, Apoc. So. Am. 199. 1878.

Amblyanthera andina Muell.-Arg. Linnaea 30: 425. 1860.

Echites andina (Muell.-Arg.) Miers, loc. cit. 204. 1878.

Echites assimilis K. Sch. in Engl. Bot. Jahrb. 25: 724. 1898.

Mandevilla montana (HBK.) Mgf. var. *peruviana* Mgf. Notizblatt 9: 82. 1924.

Suffruticose lianas; stems terete, relatively slender, finely puberulent to glabrate; leaves opposite, petiolate, ovate-lanceolate to ovate-oblong, apex acute to acuminate, base abruptly and rather broadly cordate, 4–9 cm. long, 1.5–4.0 cm. broad, membranaceous, above minutely and densely puberulent to glabrate, glandular at the base of the midrib, beneath generally puberulent to barbate in the axils of the midrib; petiole 0.75–2.0 cm. long; nodal appendages inconspicuous; inflorescence lateral, simply racemose, about as long as the subtending leaves, bearing 8–12 yellowish, reddish-tinged flowers; pedicels 0.5–1.0 cm. long; bracts lanceolate, 0.2 cm. long, scarious; calyx-lobes lanceolate, acuminate, 0.5–0.7 cm. long, scarious, minutely puberulent, the squamellae indefinitely distributed; corolla salverform, glabrous or minutely papillate without, the tube straight, 1.25–1.5 cm. long, about 0.15 cm. in diameter at the base, the lobes obliquely obovate-oblong, 1.0–1.25 cm. long, widely spreading; stamens inserted near the orifice of the corolla-tube, the anthers 0.5–0.6 cm. long, truncate; ovary oblong-ovoid, about 0.15 cm. long, glabrous; stigma 0.4–0.5 cm. long; nectaries 5, compressed-ovoid, about half as long as the ovary; follicles unknown.

ECUADOR: IMBABURA: Cotacachi, ad marg. viae ad Peribrucha, Aug. 30, 1920, Holmgren 920 (S); PICHINCHA: camino de Ciuapulo a Ciumbaja, alt. 2650 m., Nov., 1927, Firmin 241 (FM, MBG, US); in coll. interam. ca. Quito, June, 1872, Sodiro 10616 (B); Quito, Panecillo, 1892, Lagerheim s. n. (S); camino de la Magdalena a Chilibula, alt. 2800 m., Sept. 28, 1928, Firmin 608 (FM, MBG, US); Quito, date lacking, Karsten s. n. (V); Quitensian Andes, 1855, Couthouy s. n. (G, NY); near

Quito, alt. 2000 m., Nov. 20, 1880, *Lehmann* 439 (BB, K); in silv. prope Quitaga, Febr., 1874, *Sodiro* 10613 (B); Quitensian Andes, date lacking, *Jameson* 101 (BB, BM, DL, K, V); Tambillo, Aug. 13, 1878, *Jelski* 336 (B).

PERU: CAJAMARCA: Tal des Rio de Socota, Cutervo, June 6, 1915, *Weberbauer* 7131 (B).

The type specimen of this species, cited by Kunth as having been collected in the neighborhood of Tenerife, Dept. Magdalena, Colombia, has not been available for examination during these studies. The plants referred to this species in the paragraphs immediately preceding coincide closely with the original description of *Echites riparia* HBK., however, and it is believed that there they may be assigned with a fair degree of certainty.

18. *Mandevilla Jamesonii* Woodson, Ann. Mo. Bot. Gard. 19: 58. 1932.

Suffruticose lianas; stems terete, relatively slender, finely puberulent to glabrate; leaves opposite, petiolate, ovate to ovate-oblong, apex acute to acuminate, base rather abruptly and obscurely cordate, 3–6 cm. long, 2–4 cm. broad, membranaceous, above puberulent or subhirtellous to glabrate, glandular at the base of the midrib, beneath softly puberulent; petiole 0.75–1.0 cm. long; nodal appendages inconspicuous; inflorescence lateral or subterminal, simply racemose, about as long as the subtending leaves, bearing 5–7 yellowish flowers; pedicels 1.0–1.25 cm. long; bracts narrowly lanceolate, 0.2–0.3 cm. long, scarious; calyx-lobes lanceolate, acuminate, 0.4–0.5 cm. long, scarious, finely puberulent, the squamellae in alternate groups of 4–5; corolla salverform, glabrous or very minutely papillate without, the tube straight, 2 cm. long, about 0.15 cm. in diameter at the base, the lobes obliquely obovate-dolabriform, round at the apex, about as long as the tube, widely spreading; stamens inserted at about the middle of the corolla-tube, the anthers 0.5–0.6 cm. long, truncate at the base or occasionally slightly concave; ovary oblong-ovoid, about 0.1 cm. long, glabrous; stigma 0.5 cm. long; nectaries 5, compressed-ovoid, about half as long as the ovary; follicles unknown.

ECUADOR: LOJA: hedges, Loxa, date lacking, *Jameson* 153 (K, TYPE, MBG, photograph and analytical drawings).

19. **Mandevilla subsessilis** (A. DC.) Woodson, Ann. Mo. Bot. Gard. 19: 59. 1932.

Echites subsessilis A. DC. in DC. Prodr. 8: 451. 1844;
Miers, Apoc. So. Am. 199. 1878.

Suffruticose lianas; stems terete, relatively stout, glabrous or essentially so; leaves opposite, sessile or subsessile, broadly ovate to orbicular-ovate, apex obtuse to very abruptly acuminate, base conspicuously cordate and amplexicaul, 10–12 cm. long, 6–7 cm. broad in our depauperate specimen, firmly membranaceous, above minutely hispidulous to glabrate, glandular at the base of the midrib, beneath softly puberulent, particularly along the veins; nodal appendages inconspicuous; inflorescence lateral, simply racemose, somewhat surpassing the subtending leaves, bearing about 15 pale, yellowish flowers; pedicels 1 cm. long; bracts lanceolate, acuminate, 0.5 cm. long, scarious; calyx-lobes ovate-subreniform, obtuse to rounded, 0.5–0.55 cm. long, scarious, glabrous, the squamellae in alternate groups of 4–5; corolla salverform, glabrous without, the tube straight, 2 cm. long, about 0.15 cm. in diameter at the base, the lobes obliquely obovate-dolabriform, about as long as the tube, widely spreading; stamens inserted near the orifice of the corolla-tube, the anthers 0.5 cm. long, truncate or slightly concave at the base; ovary ovoid, about 0.15 cm. long, glabrous; stigma 0.4 cm. long; nectaries 5, compressed ovoid, about half as long as the ovary; follicles unknown.

PERU: "Mexico ? Peruvia ?," exact locality and date lacking, *Pavon s. n.* (BB, TYPE, MBG, photograph and analytical drawings).

Although the label indicates the type specimen of this species as of doubtful origin, the reproductive morphology indicates an indubitable affinity with the species of northern South America, and not of Mexico and Central America.

20. **Mandevilla fragilis** Woodson, Ann. Mo. Bot. Gard. 19: 59. 1932.

Suffrutescent lianas; stems terete, relatively slender, minutely and sparsely puberulent when very young, soon becoming glabrate; leaves opposite, petiolate, narrowly oblong-lanceolate, apex acuminate, base obscurely cordate, 5–7 cm. long, 0.75–1.5

cm. broad, delicately membranaceous, above glabrous, very sparsely glandular at the base of the midrib, beneath inconspicuously barbate in the axils of the midrib; petiole 0.75–1.25 cm. long; nodal appendages very inconspicuous; inflorescence lateral, simply racemose, somewhat shorter than the subtending leaves, bearing 3–5 reddish flowers; pedicels 0.75–1.0 cm. long; bracts very minute, scarious; calyx-lobes ovate, acute, 0.075–0.1 cm. long, glabrous, the alternate squamellae solitary; corolla salver-form, glabrous without, the tube 1.25 cm. long, about 0.15 cm. in diameter at the base, the lobes obliquely obovate-oblong, 0.75–1.0 cm. long, widely spreading; stamens inserted about midway within the corolla-tube, the anthers 0.3 cm. long, truncate; ovary oblong-ovoid, about 0.1 cm. long, glabrous; stigma 0.3 cm. long; nectaries 5, ovoid, about half as long as the ovary; follicles unknown.

BOLIVIA: exact locality and date lacking, Bang 2271 (K, TYP, NY, MBG, photograph and analytical drawings).

21. *Mandevilla pycnantha* (Steud.) Woodson, Ann. Mo. Bot. Gard. 19: 60. 1932.

Echites densiflora Pohl, ex Stadelm. Flora 24: Beibl. 56. 1841, not Blume.

Echites pycnantha Steud. Nomencl. ed. 2. 1: 540. 1841, nom. nud. in synon.

Echites pycnantha Steud. ex A. DC. in DC. Prodr. 8: 469. 1844; Benth. & Hook. Gen. Pl. 2: 724. 1876.

Heterothrix pycnantha (Steud.) Muell.-Arg. in Mart. Fl. Bras. 6¹: 133. pl. 40. 1860; Miers, Apoc. So. Am. 264. 1878.

Echites pycnanthe (Müll.-Arg.) Benth. & Hook. ex K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 166. 1895, sphalm.

Erect or ascending suffrutescent herbs, or low, suffruticose undershrubs; stems terete, relatively stout, hirtellous to glabrate; leaves opposite, very shortly petiolate to subsessile, broadly ovate to ovate-oblong, apex broadly obtuse to rounded, base broadly and obscurely cordate, 4–12 cm. long, 3.5–8.0 cm. broad, firmly membranaceous to subcoriaceous, above densely puberulent to

hirtellous, glandular at the base of the midrib, beneath finely tomentulose; petiole about 0.5 cm. long or somewhat less; nodal appendages inconspicuous; inflorescence both terminal and lateral, simply racemose, somewhat shorter than the subtending leaves, bearing 15–35 greenish-yellow or roseate flowers; pedicels 0.75 cm. long; bracts lanceolate, acute to acuminate, about 0.5 cm. long, scarious; calyx-lobes oblong-lanceolate, acute to acuminate, 0.4 cm. long, scarious, minutely puberulent-papillate, the squamellae in alternate groups of 4–5; corolla salverform, glabrous without, the tube straight, 0.75 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely oblong-obovate, about as long as the tube, spreading; stamens inserted about midway within the corolla-tube, the anthers 0.5 cm. long, slightly concave at the base; ovary oblong-ovoid, about 0.15 cm. long, glabrous; stigma 0.3 cm. long; nectaries 5, compressed-obovoid, about half as long as the ovary; follicles falcate, rather obscurely articulated, 7–10 cm. long, glabrous; seeds 0.7 cm. long, the brilliant tawny coma about 1.25 cm. long.

BRAZIL: MINAS GERAES: Serra do Pinheiro, date lacking, *Pohl s. n.* (Bx, MBG, photograph and analytical drawings); Serra da Lapa, date lacking, *Riedel* 985 (Bx, TYPE, G, K, V, MBG, photograph and analytical drawings).

As has already been explained (Ann. Mo. Bot. Gard. 19: 60. 1932), an examination of the only fruiting specimen of this species (*Pohl s. n.*) fails to demonstrate the complex seminal coma ascribed to it by Mueller-Argoviensis in founding the genus *Heterothrix*. Accordingly it has been transferred to *Mandevilla*, as the structure of the flowers, inflorescence, and foliar glands warrant.

22. *Mandevilla cercophylla* Woodson, Ann. Mo. Bot. Gard. 19: 61. 1932.

Suffruticose lianas; stems terete, relatively slender, glabrous; leaves opposite, petiolate, obovate-oblong, apex acuminate-subcaudate, base somewhat cuneate, obtuse or rounded, not cordate, 3–6 cm. long, 1–3 cm. broad, subcoriaceous, glabrous throughout, glandular at the base of the midrib above; petiole 0.5 cm. long; nodal appendages inconspicuous; inflorescence lateral, simply racemose, the conspicuously flexuose peduncle

somewhat shorter than the subtending leaves, bearing 8-17 rather distant, greenish-yellow or roseate flowers; pedicels 0.75-1.0 cm. long; bracts very inconspicuous, scarious; calyx-lobes ovate-trigonal, acute, 0.1 cm. long, scarious, glabrous, the squamellae indefinitely distributed; corolla tubular-salverform, glabrous without, the tube straight, 1.25 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely ovate, 0.5 cm. long, erect or essentially so; stamens inserted near the orifice of the corolla-tube, the anthers 0.45 cm. long, truncate; ovary oblong-ovoid, about 0.15 cm. long, glabrous; stigma 0.3 cm. long; nectaries 5, oblong-ovoid, compressed, about half as long as the ovary; immature follicles somewhat falcate, very obscurely articulated, 12-15 cm. long, glabrous.

PERU: HUANUCO: Casapi, date lacking, Matthews 1978 (K, Camb., TYPE, MBG, photograph and analytical drawings).

23. *Mandevilla brachyloba* (Muell.-Arg.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 171. 1895.

Amblyanthera brachyloba Muell.-Arg. Linnaea 30:423. 1860.

Echites brachyloba (Muell.-Arg.) Miers, Apoc. So. Am. 203. 1878.

Suffruticose lianas; stems terete, relatively slender, finely and densely puberulent to glabrate; leaves opposite, petiolate, ovate to ovate-oblong, apex rather abruptly acuminate, base abruptly and broadly cordate, 4-12 cm. long, 2-6 cm. broad, membranaceous, above minutely puberulent to glabrate, glandular at the base of the midrib, beneath generally puberulent to barbate in the axils of the midrib, infrequently glabrate; petiole 1.25-4.0 cm. long; nodal appendages minute; inflorescence lateral, simply racemose, somewhat surpassing the subtending leaves, bearing 15-40 reddish flowers; pedicels 0.75-1.0 cm. long; bracts lanceolate, 0.15-0.3 cm. long, scarious; calyx-lobes ovate-trigonal, acute, 0.2-0.25 cm. long, scarious, densely puberulent-papillate, the squamellae indefinitely distributed; corolla tubular-salverform, densely glandular-papillate without (becoming black when desiccated), the tube straight, 1.5-1.75 cm. long, about 0.15 cm. in diameter at the base, the lobes obliquely ovate, 0.2-0.3 cm. long, erect or essentially so; stamens inserted near the orifice of

the corolla-tube, the anthers 0.4 cm. long, obscurely concave at the base; ovary oblong-ovoid, about 0.15 cm. long, glabrous; stigma 0.15 cm. long; nectaries 5, compressed-ovoid, about half as long as the ovary; follicles somewhat falcate, continuous or very inconspicuously articulated, 20–30 cm. long, glabrous; seeds 1.25 cm. long, the pale tawny coma about 2 cm. long.

PERU: ANCASH: quebrada of Pariahuanca, date lacking, *Mathews* 820 (K); HUANCABELICA: rechte Talwand des Flusses Montaro, unter Surocabamba, alt. 1900–2000 m., March 15, 1913, *Weberbauer* 6498 (B, FM, US); PUNO: Sandia, alt. 2100–2300 m., May 15, 1902, *Weberbauer* 536 (B).

BOLIVIA: LA PAZ: Coroico, alt. 6000–7000 ft., Febr., 1866, *Pearce s. n.* (K); Milluhuaya, alt. 1300 m., Dec., 1917, *Buchtien* 609 (B, BM, C, G, K, MBG, NY, S, US); Hacienda Simaco, sobre el camino a Tipuani, alt. 1400 m., Jan., 1920, *Buchtien* 5099 (US); Sirupaya, vecindad de Yanacachi, alt. 2100 m., Nov. 14, 1906, *Buchtien* 277 (FM, US); Mapiri, alt. 2500 ft., May, 1886, *Rusby* 2585 (B, BB, G, MBG, NY, US, V); Apolo, alt. 4800 ft., Febr. 23, 1902, *Williams* 81 (BM, K, NY, US); Yungas, 1890, *Bang* 461 (B, BB, C, K, MBG, US); Hacienda Casane, sobre el camino a Tipuani, alt. 1400 m., April 13, 1923, *Buchtien* 7439 (C); COCHABAMBA: Walrand, Socotal, Prov. Chapare, alt. 1500 m., Febr. 8, 1929, *Steinbach* 9090 (FM, S).

ARGENTINA: JUJUY: Quinta prope Laguna de la Brea, in marg. silv., June 6, 1901, *Fries* 127 (S).

24. Mandevilla Pentlandiana (A. DC.) Woodson, Ann. Mo. Bot. Gard. 19: 63. 1932.

Parsonsia ? bracteata (Hook. & Arn.) in Hook. Jour. Bot. 1: 287. 1834; A. DC. in DC. Prodr. 8: 402. 1844.

Lasequea Pentlandiana A. DC. Ann. Sci. Nat. Bot. III. 1: 262. 1844; Miers, Apoc. So. Am. 253. 1878.

Lasequea Hookeri Muell.-Arg. in Mart. Fl. Bras. 6¹: 136. 1860; Miers, loc. cit. 1878.

Lasequea bracteata (Hook. & Arn.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 171. 1895.

Lasequea Mandoni Britton, ex Rusby, Mem. Torrey Bot. Club 4: 220. 1895.

Suffruticose lianas; stems relatively stout, terete, densely puberulent or hirtellous to glabrate; leaves opposite, petiolate, broadly ovate, apex acutely acuminate, base rather abruptly and broadly cordate, 6–14 cm. long, 4–10 cm. broad, membranaceous, above densely puberulent to glabrate, glandular at the base of the midrib, beneath densely tomentulose to glabrate; petiole 1.5–4.0 cm. long; nodal appendages minute; inflorescence lateral

or rarely subterminal, simply racemose, about twice as long as the subtending leaves, bearing 15–40 greenish-white or cream-colored flowers congested toward the upper half of the peduncle; pedicels 0.25–0.75 cm. long; bracts narrowly oblong-lanceolate, 0.75–2.0 cm. long, subfoliaceous or petaloid; calyx-lobes narrowly oblong-lanceolate, acute to acuminate, 1.0–1.5 cm. long, subfoliaceous or somewhat petaloid, glabrous or minutely papillate, the squamellae indefinitely distributed; corolla tubular-silver-form, densely papillate without, the tube straight, 0.75–1.25 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely ovate, 0.2–0.3 cm. long, erect or essentially so; stamens inserted somewhat above midway within the corolla-tube, the anthers 0.5–0.525 cm. long, truncate or merely somewhat concave at the base; ovary oblong-ovoid, about 0.15 cm. long, glabrous; stigma 0.3–0.35 cm. long; nectaries 5, compressed-ovoid, about half as long as the ovary; follicles somewhat falcate, continuous, puberulent-papillate to glabrate, 15–20 cm. long; seeds 0.5–0.75 cm. long, the pale tawny coma about 1.5 cm. long.

BOLIVIA: TERRE NAC. DE COLONIAS: cotaña am Illimani, alt. 2450 m., Nov., 1911, Buchtien 250 (FM, G, MBG, NY, US); Camacho, alt. 2500 m., Dec. 15, 1903, Fiebrig 2580 (AA); LA PAZ: Milluhuaya, alt. 1300 m., Dec., 1917, Buchtien 4671 (G, US); Yungas, 1890, Bang 402 (FM, G, MBG, NY, US); COCHABAMBA: Tunari, May 4, 1892, Kuntze s. n. (FM, NY).

ARGENTINA: JUJUY: exact locality lacking, Oct., 1892, Kuntze s. n. (NY); TUCUMAN: Alto de Medina, Jan. 11, 1924, Venturi 2733 (BA, MBG); Cerro del Campo, Febr. 12, 1930, Venturi 10180 (AA); Alambradas, Dept. Capital, alt. 450 m., Jan., 1919, Venturi 178 (MBG); Villa Naugues, Famailla, alt. 1100 m., Jan., 1926, Venturi 4076 (MBG); CATAMARCA: Andalgala, Dec. 29, 1916, Jørgensen 1605 (G, MBG, US); COORDOBA: exact locality lacking, Dec., 1891, Kuntze s. n. (FM, NY).

For notes on this species reference is made to Ann. Mo. Bot. Gard. 19: 64. 1932.

25. *Mandevilla erecta* (Vell.) Woodson, Ann. Mo. Bot. Gard. 19: 62. 1932.

Echites erecta Vell. Fl. Flum. 113. 1830; Icon. 3: pl. 45. 1827.

Echites emarginata Vell. loc. cit. pl. 46. 1827.

Lasequea Guilleminiana A. DC. in DC. Prodr. 8: 481. 1844; *ibid.* Ann. Sci. Nat. Bot. III. 1: 261. 1844; Miers, Apoc. So. Am. 249. 1878.

- Lasequea emarginata* (Vell.) A. DC. in DC. Prodr. 8: 481. 1844; *ibid.* Ann. Sci. Nat. Bot. III. 1: 261. 1844; Muell.-Arg. in Mart. Fl. Bras. 6¹: 136. 1860; Miers, Apoc. So. Am. 250. 1878.
- Lasequea obliquinervia* A. DC. Ann. Sci. Nat. Bot. III. 1: 261. 1844; Miers, loc. cit. 250. 1878.
- Lasequea acutifolia* A. DC. loc. cit. 1844; Arech. Ann. Mus. Nac. Montevideo 7: 73. 1910.
- Lasequea glabra* A. DC. loc. cit. 262. 1844; Miers, loc. cit. 1878.
- Lasequea erecta* (Vell.) Muell.-Arg. loc. cit. 135. 1860; Miers, loc. cit. 249. 1878.
- Lasequea erecta* (Vell.) Muell.-Arg. α . *Guilleminiana* (A. DC.) Muell.-Arg. loc. cit. pl. 41. 1860.
- Lasequea erecta* (Vell.) Muell.-Arg. α . *Guilleminiana* (A. DC.) Muell.-Arg. 1. *griseo-olivacea* Muell.-Arg. loc. cit. 1860.
- Echites bracteata* Mart. ex Muell.-Arg. loc. cit. 1860, not Vell., nor HBK., nom. nud. in synon.
- Lasequea erecta* (Vell.) Muell.-Arg. α . *Guilleminiana* (A. DC.) Muell.-Arg. 2. *griseo-fusca* Muell.-Arg. loc. cit. 1860.
- Lasequea erecta* (Vell.) Muell.-Arg. β . *obliquinervia* (A. DC.) Muell.-Arg. loc. cit. 1860.
- Lasequea erecta* (Vell.) Muell.-Arg. β . *obliquinervia* (A. DC.) Muell.-Arg. $\alpha\alpha$. *ovata* Muell.-Arg. loc. cit. 1860.
- Lasequea erecta* (Vell.) Muell.-Arg. β . *obliquinervia* (A. DC.) Muell.-Arg. $\beta\beta$. *ovata* Muell.-Arg. loc. cit. 1860.
- Lasequea erecta* (Vell.) Muell.-Arg. β . *obliquinervia* (A. DC.) Muell.-Arg. loc. cit. 1860.
- Lasequea erecta* (Vell.) Muell.-Arg. γ . *glabrescens* Muell.-Arg. loc. cit. 1860.
- Lasequea erecta* (Vell.) Muell.-Arg. δ . *acutifolia* (A. DC.) Muell.-Arg. loc. cit. 1860.
- Lasequea erecta* (Vell.) Muell.-Arg. ϵ . *scabrinervia* Muell.-Arg. loc. cit. 136. 1860.
- Lasequea erecta* (Vell.) Muell.-Arg. ζ . *glabra* (A. DC.) Muell.-Arg. loc. cit. 1860.

- Lasequea acutifolia* A. DC. forma α . *Guilleminiana* (A. DC.)
Muell.-Arg. ex Arech. loc. cit. 72. 1910, sphalm.
- Lasequea acutifolia* A. DC. forma α . *Guilleminiana* (A. DC.)
Muell.-Arg. 1. *Griseo-olivacea* (Muell.-Arg.) Arech. loc.
cit. 1910.
- Lasequea acutifolia* A. DC. forma α . *Guilleminiana* (A. DC.)
Muell.-Arg. 2. *Griseo-fusca* (Muell.-Arg.) Arech. loc. cit.
1910.
- Lasequea acutifolia* A. DC. forma β . *obliquinervia* (A. DC.)
Muell.-Arg. ex Arech. loc. cit. 1910, sphalm.
- Lasequea acutifolia* A. DC. forma β . *obliquinervia* (A. DC.)
Muell.-Arg. $\alpha\alpha$. *ovata* (Muell.-Arg.) Arech. loc. cit. 73.
1910.
- Lasequea acutifolia* A. DC. forma β . *obliquinervia* (A. DC.)
Muell.-Arg. $\alpha\alpha$. *ovata* (Muell.-Arg.) Arech. 1. *griseo*
olivacea (Muell.-Arg.) Arech. loc. cit. 1910.
- Lasequea acutifolia* A. DC. forma β . *obliquinervia* (A. DC.)
Muell.-Arg. $\beta\beta$. *obovata* (Muell.-Arg.) Arech. loc. cit. 1910.
- Lasequea acutifolia* A. DC. forma γ . *Glabrescens* Muell.-Arg.
ex Arech. loc. cit. 1910, sphalm.
- Lasequea acutifolia* A. DC. forma δ . *scabrinervis* Muell.-Arg.
ex Arech. loc. cit. 1910, sphalm.
- Lasequea acutifolia* A. DC. forma ϵ . *glabra* (A. DC.) Muell.-
Arg. ex Arech. loc. cit. 1910, sphalm.

Erect or ascending, suffrutescent herbs, or low, suffrutescent undershrubs; stems terete, relatively stout, densely puberulent or hirtellous to glabrate; leaves opposite, very shortly petiolate or subsessile, broadly ovate to orbicular-ovate, apex very abruptly acuminate to obtuse or rounded, occasionally somewhat retuse or emarginate, base rather abruptly and broadly cordate, 4–10 cm. long, 2–7 cm. broad, membranaceous, above densely puberulent or hirtellous to glabrate, glandular at the base of the midrib, beneath densely tomentulose (to glabrate or rarely glabrous ?); petiole 0.2–0.5 cm. long; nodal appendages obsolete; inflorescence terminal or subterminal, simply racemose, about twice as long as the subtending leaves, bearing 10–30 congested, greenish-white or yellowish flowers along the peduncle; pedicels 0.25–0.5 cm. long; bracts narrowly oblong-lanceolate, 0.75–1.5

cm. long, subfoliaceous or somewhat petaloid; calyx-lobes narrowly oblong-lanceolate, acute to acuminate, 1.0–1.5 cm. long, subfoliaceous or somewhat petaloid, glabrous; corolla tubular-salverform, densely papillate without, the tube straight, 0.75–1.0 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely ovate, 0.2–0.3 cm. long, erect or essentially so; stamens inserted somewhat above midway within the corolla-tube, the anthers 0.5 cm. long, truncate or somewhat concave at the base; ovary oblong-ovoid, about 0.1 cm. long, glabrous; stigma 0.3 cm. long; nectaries 5, compressed-obvoid, about half as long as the ovary; follicles slightly falcate, continuous, 15–20 cm. long, minutely puberulent-papillate to glabrate; seeds 0.75 cm. long, the pale tawny coma about 1.5 cm. long.

BRAZIL: MINAS GERAES: Lagoa Santa, 1864, *Warming s. n.* (C, NY); data incomplete: Dec., 1846, *Regnell II 186* (FM, S, US); *Claussen s. n.* (BB, BM, K, NY); *Widgren 581* (G, S, US); SÃO PAULO: data incomplete: *Lund s. n.* (C); *Weddell s. n.* (BM); PARANA: Jaguariahyva, in fruticetis, alt. 740 m., Nov. 26, 1914, *Dusen 15946* (MBG, NY); Turma, ad marg. silvulas, Jan. 23, 1910, *Dusen 9086* (G, US); Capão Bonito, in campo fruticosa, alt. 790 m., March 28, 1915, *Dusen 16998* (G).

PARAGUAY: in regione fl. Alto Parana, 1909–10, *Fiebrig 6373* (G, US).

URUGUAY: Montevideo, date lacking, *Sello s. n.* (BM, Camb.).

ARGENTINA: MISIONES: Posadas, Bonpland, in campo inter frutices, Dec. 28–29, 1907, *Ekman 1594* (MBG).

A full discussion of the many reasons for merging *Lasequea* with *Mandevilla* has been given in Ann. Mo. Bot. Gard. 19: 62–63. 1932. The unusually long and cumbersome list of synonyms testifies to the variability of *M. erecta*. It will be observed, furthermore, that with the exception of the several species proposed by de Candolle, the categories into which the species has been divided have been of varietal, formal, or lesser rank. Even with the comparatively few specimens which have been available for the present study of the species, it has seemed advisable not to recognize the many minor divisions proposed by Mueller-Argoviensis, since all are based upon intergrading factors such as degree and character of indument, size and shape of leaves, color of desiccated specimens, etc.

26. *Mandevilla congesta* (HBK.) Woodson, comb. nov.
Echites congesta HBK. Nov. Gen. 3: 214. 1819; A. DC. in
DC. Prodr. 8: 466. 1844; Miers, Apoc. So. Am. 200.
1878.

Echites pubescens R. & S. Syst. 4: 796. 1819; A. DC. loc. cit. 476. 1844, not Hook. & Arn.

Dipladenia Fendleri Muell.-Arg. Linnaea 30: 417. 1860.

Prestoniopsis pubescens (R. & S.) Muell.-Arg. Bot. Zeit. 18: 22. 1860; Miers, loc. cit. 166. 1878.

Dipladenia stenoloba Heurck & Muell.-Arg. in Van Heurck, Pl. Nov. Herb. Heurck. 2: 158. 1870.

Amblyanthera congesta Müll. ex Miers, loc. cit. 200. 1878, sphalm in synon.

Prestoniopsis hirsuta Miers, loc. cit. 167. 1878.

Prestoniopsis venosa Miers, loc. cit. 1878.

Prestoniopsis Fendleri (Muell.-Arg.) Miers, loc. cit. 168. 1878.

Dipladenia congesta (HBK.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 169. 1895.

Suffruticose lianas; stems terete, relatively stout, shaggy-pilose or pilosulose to glabrate; leaves opposite, petiolate, broadly oblong-elliptic to obovate-oblong, apex abruptly acuminate, base broadly and rather obscurely cordate, 6–15 cm. long, 3–9 cm. broad, membranaceous, above sparsely pilosulose to glabrate, sparsely glandular along the midrib, beneath finely tomentulose; petiole 1–3 cm. long; nodal appendages minute; inflorescence lateral or subterminal, simply racemose, usually somewhat shorter than the subtending leaves, bearing 7–20 white or yellowish flowers congested toward the upper half of the peduncle; pedicels 1.0–1.5 cm. long; bracts narrowly oblong to linear-lanceolate, 0.5–2.0 cm. long, subfoliaceous or somewhat petaloid; calyx-lobes linear-lanceolate, acuminate, 0.75–1.0 cm. long, sparsely pilosulose, the squamellae in alternate groups of 2–6; corolla salverform, glabrous without, the tube straight, 0.75–1.25 cm. long, about 0.2 cm. in diameter at the base, the lobes obliquely oblong-elliptic, long-acuminate, 1.25–1.5 cm. long, widely spreading; stamens inserted toward the base of the corolla-tube, the anthers 0.3 cm. long, truncate or merely somewhat concave at the base; ovary oblong-ovoid, about 0.1 cm. long, glabrous; stigma 0.2 cm. long; nectaries usually 2, $\frac{1}{3}$ – $\frac{1}{2}$ as long as the ovary; follicles unknown.

COLOMBIA: CUNDINAMARCA: Bogota, alt. 2700 m., 1851–57, Triana 1909 (BM);

(72)

same locality, Jan., 1826, *Purdie s. n.* (K); *Tracey* 297 (K); *Mutis s. n.* (BM, US, MBG, photograph).

ECUADOR: TUNGURAHUA: in sylvis, alt. 7000 ft., May, 1858, *Spruce* 5390 (B, C, Camb., G, K, V).

VENEZUELA: MERIDA: prope coloniam Tovar, 1854-55, *Fendler* 1030 (BB, G, K, MBG); same locality, April 9, 1859, *Crueger s. n.* (K); Mucuruba, quebrada del pueblo, alt. 2700-2800 m., June 27, 1930, *Gehriger* 262 (MBG, US).

27. *Mandevilla Achrestogyne* Woodson, comb. nov.

Dipladenia Achrestogyne Woodson, Ann. Mo. Bot. Gard. 18: 543. 1931.

Suffruticose lianas; stems terete, relatively stout, glabrous; leaves opposite, petiolate, broadly ovate-oblong, apex shortly acuminate, base broadly and rather obscurely cordate, 5-9 cm. long, 2.5-6.0 cm. broad, firmly membranaceous, glabrous, glandular at the base of the midrib above; petiole 0.5-1.5 cm. long; nodal appendages minute; inflorescence lateral, alternate, simply racemose, about as long as the subtending leaves, bearing 5-15 greenish or pale yellow flowers; pedicels 0.5 cm. long; bracts ovate-lanceolate, 0.5-0.7 cm. long, scarious; calyx-lobes lanceolate, acute to acuminate, 0.3-0.4 cm. long, scarious, glabrous, the squamellae indefinitely distributed; corolla salverform, glabrous without, the tube straight, 1.5-1.75 cm. long, about 0.125 cm. in diameter at the base, the lobes obliquely obovate-oblong, 0.75-1.0 cm. long, spreading; stamens inserted somewhat below midway within the corolla-tube, the anthers 0.5 cm. long, truncate or slightly concave at the base; ovary oblongoid, about 0.1 cm. long, glabrous; stigma 0.35 cm. long; nectaries 2-5, extremely inconspicuous; follicles unknown.

COLOMBIA: CUNDINAMARCA: rocky canyon, Chapinero, near Bogota, alt. 2800-2900 m., Sept. 18-23, 1917, *Pennell* 2034 (NY, TYPE, MBG, photograph and analytical drawings).

28. *Mandevilla bogotensis* (HBK.) Woodson, Ann. Mo. Bot. Gard. 19: 73. 1932.

Echites bogotensis HBK. Nov. Gen. 3: 215. pl. 243. 1819.

Amblyanthera Bogotensis (HBK.) Muell.-Arg. Linnaea 30: 452. 1860.

Anartia Bogotensis (HBK.) Miers, Apoc. So. Am. 82. 1878.

Suffruticose lianas; stems terete, relatively stout, glabrous; leaves opposite, petiolate, oblong- to obovate-elliptic, apex

acuminate, base obscurely cordate, 5–9 cm. long, 2.5–3.5 cm. broad, subcoriaceous, above glabrous, glandular at the base of the midrib, beneath minutely granular-papillate; petiole 0.75–1.0 cm. long; nodal appendages minute; inflorescence lateral, opposite, simply racemose, much shorter than the leaves, bearing 6–10 greenish-white flowers; pedicels 0.2–0.4 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-oblong, acute to acuminate, 0.25–0.3 cm. long, scarious, glabrous, the squamellae in alternate groups of 4–6; corolla salverform, glabrous without, the tube straight, 0.75 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely obovate-oblong, 1.25 cm. long, spreading; stamens inserted somewhat below midway within the corolla-tube, the anthers 0.5 cm. long, slightly concave at the base; ovary oblongoid, about 0.1 cm. long, glabrous; stigma 0.25 cm. long; nectaries completely obsolete; follicles unknown.

COLOMBIA: exact locality and date lacking, *Mutis s. n.* (US, ISOTYPE, MBG, photograph and analytical drawings).

29. *Mandevilla subpaniculata* Woodson, Ann. Mo. Bot. Gard. 19: 71. 1932.

Echites macrophylla A. Zahlbr. Ann. K. K. Naturh. Hofmus. Wien 7: 5. 1892, not HBK.

Suffruticose lianas; stems terete, relatively stout, minutely puberulent when young, soon becoming glabrate; leaves opposite, petiolate, ovate to broadly ovate-oblong, occasionally suborbicular, apex abruptly acuminate to obtuse or rounded, base broadly cordate, 15–20 cm. long, 10–13 cm. broad, membranaceous, above densely puberulent, glandular at the base of the midrib, beneath finely tomentulose to puberulent; petiole 3–5 cm. long; nodal appendages very inconspicuous; inflorescence lateral or subterminal, alternate, rather obscurely subpaniculate, about half as long as the subtending leaves, bearing 10–20 white or yellowish flowers; pedicels 0.5 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-trigonal, acute, 0.2 cm. long, scarious, densely puberulent-papillate without, the squamellae in alternate groups of 2–6; corolla salverform, finely puberulent-papillate without, the tube straight, 1.25 cm. long, about 0.125 cm. in diameter at the base, the lobes obliquely obovate, 1.0–1.25 cm.

long, spreading; stamens inserted near the base of the corolla-tube, the anthers 0.5–0.6 cm. long, slightly concave at the base; ovary oblongoid, about 0.1 cm. long, glabrous; stigma 0.3 cm. long; nectaries completely obsolete; follicles unknown.

ECUADOR: CHIMBORAZO: Rio Chasman, date lacking, *Spruce s. n.* (K, V, MBG, photograph and analytical drawings); PICHINCHA: Tambillo, July 9, 1878, *Jelski 32* (V, TYPE, MBG, photograph and analytical drawings).

Sect. 4. *TENUIFOLIAE* Woodson. Corolla salverform; nectaries 2; anthers broadly elliptic to ovate, inconspicuously auriculate; erect or ascending, suffrutescent herbs (infrequently twining in *M. tenuifolia*) of South America. *Spp. 30–31.*

KEY TO THE SPECIES

- a. Leaves linear to narrowly oblong, rarely narrowly elliptic, 3–12 cm. long; peduncles scarcely surpassing the foliage; squamellae in groups of 4–6. 30. *M. tenuifolia*
- aa. Leaves filiform, 0.5–1.0 cm. long; peduncles greatly surpassing the foliage; squamellae geminate. 31. *M. myriophyllum*

30. *Mandevilla tenuifolia* (Mikan) Woodson, comb. nov.

Echites tenuifolia Mikan, Fl. & Faun. Bras. fasc. 3. 1820; Stadelm. Flora 24¹: Beibl. 53. 1841.

Echites pastorum Mart. ex Stadelm. loc. cit. 52. 1841.

Echites peduncularis Stadelm. loc. cit. 54. 1841.

Dipladenia pastorum (Mart.) A. DC. in DC. Prodr. 8: 482. 1844.

Dipladenia tenuifolia (Mikan) A. DC. loc. cit. 1844.

Dipladenia tenuifolia (Mikan) A. DC. β . *puberula* A. DC. loc. cit. 1844.

Dipladenia tenuifolia (Mikan) A. DC. γ . *volubilis* A. DC. loc. cit. 1844.

Dipladenia peduncularis (Stadelm.) A. DC. loc. cit. 1844.

Dipladenia linariaefolia A. DC. loc. cit. 1844.

Dipladenia vincaeiflora Lem. Fl. Serres & Jard. 2¹: pl. 6. 1846.

Dipladenia polymorpha Muell.-Arg. in Mart. Fl. Bras. 6¹: 121. 1860.

Dipladenia polymorpha Muell.-Arg. α . *tenuifolia* (Mikan) Muell.-Arg. loc. cit. pl. 36. 1860.

- Dipladenia polymorpha* Muell.-Arg. $\alpha.$ *tenuifolia* (Mikan) Muell.-Arg. 1. *glabra* Muell.-Arg. loc. cit. 1860.
Dipladenia polymorpha Muell.-Arg. $\alpha.$ *tenuifolia* (Mikan) Muell.-Arg. 2. *volubilis* (A. DC.) Muell.-Arg. loc. cit. 1860.
Dipladenia polymorpha Muell.-Arg. $\alpha.$ *tenuifolia* (Mikan) Muell.-Arg. 3. *puberula* (A. DC.) Muell.-Arg. loc. cit. 1860.
Dipladenia polymorpha Muell.-Arg. $\beta.$ *intermedia* Muell.-Arg. loc. cit. 1860.
Dipladenia polymorpha Muell.-Arg. $\gamma.$ *peduncularis* (Stadelm.) Muell.-Arg. loc. cit. 122. 1860.
Dipladenia polymorpha Muell.-Arg. $\delta.$ *brevifolia* Muell.-Arg. loc. cit. 1860.
Homaladenia tenuifolia (Mikan) Miers, Apoc. So Am. 164. pl. 24A. 1878.
Homaladenia linariaefolia (A. DC.) Miers, loc. cit. 1878.
Homaladenia pastorum (Stadelm.) Miers, loc. cit. 1878.
Homaladenia peduncularis (Stadelm.) Miers, loc. cit. 165. 1878.
Homaladenia puberula (A. DC.) Miers, loc. cit. 1878.
Homaladenia brevifolia (Muell.-Arg.) Miers, loc. cit. 1878.
Homaladenia vincaeiflora (Lem.) Miers, loc. cit. 1878.
Dipladenia tenuifolia (Mik.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 169. 1895, sphalm.
Dipladenia pastorum (Stadelm.) A. DC. var. *tenuifolia* (Mikan) Hook. f. Bot. Mag. III. 56: pl. 7725. 1900.
Dipladenia tenuifolia (Mikan) A. DC. f. *pastorum* (Stadelm.) Handel-Mzt. Denkschr. K. K. Akad. Wiss. Wien 79²: 11. 1910.

Erect or ascending, rarely twining, suffrutescent herbs from a fleshy, napiform root; stems terete, slender, usually minutely puberulent or pilosulose to glabrate, infrequently glabrous; leaves opposite or rarely ternate, shortly petiolate to subsessile, linear to very narrowly oblong, rarely narrowly elliptic, 3–12 cm. long, 0.2–0.75 cm. broad, membranaceous, sparsely and minutely pilosulose to glabrate; nodal appendages essentially obsolete; inflorescence lateral or subterminal, simply racemose, equaling

or scarcely surpassing the subtending leaves, bearing 2–6 bright rose-pink flowers congested toward the end of the peduncle; pedicels 0.5–0.75 cm. long; bracts minutely ovate, scarious, 0.1–0.2 cm. long; calyx-lobes broadly lanceolate, acuminate, 0.2–0.4 cm. long, scarious, glabrous, the squamellae in alternate groups of 4–6; corolla salverform, glabrous without, the tube straight, 1.5–3.0 cm. long, about 0.1 cm. in diameter at the base, the lobes obliquely obovate, 1.0–1.75 cm. long, spreading; stamens inserted near the orifice of the corolla-tube, the anthers 0.3 cm. long, obscurely auriculate; ovary oblongoid, about 0.15 cm. long, glabrous; stigma 0.15 cm. long; nectaries 2, compressed-ovoid, about half as long as the ovary; follicles somewhat falcate, continuous or very slightly articulated, 6–8 cm. long, glabrous; seeds 0.75 cm. long, the bright tawny coma about 1 cm. long.

BRAZIL: PARA: Montealegre, Serra Ituajury, April 25, 1916, Ducke 16075 (US); campos da l'Ariramba, Dec. 2, 1910, Ducke 11297 (US); PARAHYBA: Serra Borborema, July, 1921, Luetzelburg 12599 (M); BAHIA: in overgrazed scrub, 30 km. west-southwest of Joazeiro, Dec. 15, 1924, Chase 7945 (US); taboleiro bei Remariso, Dec., 1906, Ule 7405 (K); Serra de Acurua, 1839, Blanchet 2807 (M, NY); Serra de Monte Santo, March-April, Martius 2267 (M); exact locality and date lacking, Blanchet 3406 (Bx, C, MBG); GOIAS: campinas, Duro, 1914, Luetzelburg 383 (M); MINAS GERAES: Morro do Gaspar Suarez, date lacking, Pohl s. n. (M); DATA INCOMPLETE: Glaziou 17136 (C); Riedel s. n. (BB, G, M); Claussen 106 (Bx); Martius s. n. (M); Regnell II 873 (US); Miers 2418 (BM, US); Ackermann s. n. (Bx); Claussen 165 (Bx); Sello 1662 (Bx); Sello 1313 (Bx); Burchell 8909 (Bx); Glaziou 15219 (Bx); Glaziou 16250 (C); Glaziou 15218 (C).

The great variability of this species, which is responsible for the formidable synonymy presented in detail above, does not appear to permit classification into well-marked varieties and forms at this time. It would appear that the erect or volubile habit of the plants may be largely due to ecological conditions, since it is almost invariably erect and bushy in nature, inhabiting plains or scrublands characterized by somewhat scanty rainfall, while in cultivation (cf. Van Houtte; Hook. f. *ll. cc.*) only the twining aspect has been reported. The rather tenuous indument which is present in somewhat greater or lesser degree in all specimens similarly offers little distinction for taxonomic purposes. The species is evidently a familiar object of the region which it inhabits, the fleshy underground root-stalks earning

for it the colloquial name of "batata do vaseiro (cow-boy's potato)."

31. **Mandevilla myriophyllum** (Taub.) Woodson, comb. nov.

Dipladenia myriophyllum Taub. in Engl. Bot. Jahrb. 21: 448. 1896.

Dipladenia acicularis K. Sch. in Glaziou, Bull. Soc. Bot. Fr. 57: Mem. 3°. 457. 1910.

Erect, subcaespitose, suffrutescent herbs; stems terete, filiform, minutely and sparsely pilosulous to glabrate or glabrous; leaves opposite to verticillate, very congested, sessile or subsessile, filiform, 0.5–1.0 cm. long, membranaceous, essentially glabrous; inflorescence terminal to subterminal, simply racemose, greatly surpassing the foliage, bearing 3–8 bright rose-pink flowers toward the distal half of the peduncle; pedicels 0.5–1.0 cm. long; bracts linear, 0.1–0.3 cm. long, scarious; calyx-lobes lanceolate, long-acuminate, 0.2–0.3 cm. long, scarious, glabrous, the alternate squamellae geminate; corolla salverform, glabrous without, the tube straight, 1.0–1.5 cm. long, somewhat less than 0.1 cm. in diameter at the base, the lobes obliquely obovate, 0.75 cm. long, reflexed or widely spreading; stamens inserted near the orifice of the corolla-tube, the anthers 0.25 cm. long, obscurely auriculate; ovary ovoid-oblongoid, about 0.75 cm. long, glabrous; stigma 0.5 cm. long; nectaries 2, compressed-obvoid, about as long as the ovary; follicles unknown.

BRAZIL: GOIAS: Serra da Baliza, Jan. 4, 1896, Glaziou 21721 (Bx, MP, US); exact locality lacking, Nov., 1892, Ule 14747 [324] (B, TYPE, US, MBG, photograph and analytical drawings).

Very closely related to *M. tenuifolia* and possessing a fleshy, tuberous root-stalk similar to that of the latter species. The type specimen of *Dipladenia acicularis* K. Sch. (Glaziou 21722a in Hb. Berol.) appears at first examination to merit taxonomic designation, having somewhat longer, sparser foliage, and taller stems. Duplicate specimens of the type collection, however, plainly show these characters to be too unstable for use as specific criteria.

Sect. 5. LAXAE Woodson. Corolla infundibuliform; nectaries 2–5; anthers narrowly oblong to oblong-ovate, auriculate to

truncate; lianas and suffrutescent herbs of Mexico, Central and South America. *Spp.* 32–77.

KEY TO THE SPECIES

- a. Lianas; inflorescence lateral, or occasionally subterminal.
- b. Nectaries 5.
- c. Nectaries about as long as the ovary, or somewhat longer; species of Mexico.
 - d. Corolla 2–3 cm. long, the proper-tube about as long as the throat, markedly constricted at the insertion of the stamens. 32. *M. oaxacana*
 - dd. Corolla 1.0–1.6 cm. long, the proper-tube much shorter than the throat, not markedly constricted at the insertion of the stamens.
 - e. Leaves broadly cordate, 8–12 cm. long; inflorescence secund. 33. *M. convolvulacea*
 - ee. Leaves not cordate, at least the upper, 2–5 cm. long; inflorescence not secund. 34. *M. Andrieuxii*
- cc. Nectaries shorter than the ovary; species of Central and South America.
 - d. Anthers truncate, not emarginate or auriculate.
 - e. Corolla greenish-white or cream-colored.
 - f. Corolla 1.0–1.25 cm. long, the proper-tube scarcely narrower than the throat. 35. *M. equatorialis*
 - ff. Corolla 3.5–4.0 cm. long, the proper-tube much narrower than the throat. 36. *M. albo-viridis*
 - ee. Corolla rich reddish-purple. 37. *M. veraguensis*
- dd. Anthers auriculate or emarginate at the base.
- e. Leaves glandular at the base of the midrib only.
 - f. Inflorescences opposite, or potentially so. 38. *M. glandulosa*
 - ff. Inflorescences alternate only.
 - g. Corolla greenish-white or cream-colored; nectaries essentially uniform.
 - h. Squamellae in groups alternate with the calyx-lobes or indefinitely distributed.
 - i. Calyx-lobes much shorter than the proper-tube of the corolla; leaves broadly ovate to oblong-elliptic, abruptly acuminate. 39. *M. subcordata*
 - ii. Calyx-lobes about as long as the proper-tube of the corolla or somewhat longer; leaves ovate to broadly ovate-elliptic, long-acuminate.
 - j. Leaves uniformly puberulent beneath; corolla-throat greatly surpassing the proper-tube; plants of Bolivia and southern Peru. 40. *M. Bridgesii*
 - jj. Leaves barbate in the axis of the midrib beneath; corolla-throat about as long as the proper-tube or somewhat longer; species of northern Argentina and southern Bolivia.
 - k. Corolla 4–8 cm. long, the lobes about as long as the throat. 41. *M. laxa*

- kk. Corolla 2.5–3.0 cm. long, the lobes about half as long as the throat..... 42. *M. grata*
- hh. Squamellae solitary and opposite the calyx-lobes..... 43. *M. funiformis*
- gg. Corolla pink; nectaries more or less dissimilar. 44. *M. Luetzelburgii*
- ee. Leaves sparsely glandular the length of the midrib; corolla-tube white or cream-colored, the limb shading to deep rose and bronze at the margin..... 45. *M. callista*
- bb. Nectaries predominantly 2, rarely as many as 5 in some species.
- c. Nodes conspicuously appendiculate throughout.
- d. Leaves coriaceous.
- e. Corolla-throat broadly conical or campanulate..... 46. *M. Martiana*
- ee. Corolla-throat narrowly conical to subtubular.
- f. Corolla-throat longer than the proper-tube..... 47. *M. crassinoda*
- ff. Corolla-throat about as long as the proper-tube.
- g. Leaves oblong to obovate-elliptic, 4–8 cm. long; plants of Venezuela and Dutch Guiana..... 48. *M. surinamensis*
- gg. Leaves suborbicular to broadly obovate, 1.5–4.0 cm. long; species of northeastern Brasil.
- h. Inflorescence subterminal, terminating short lateral branches; leaves obovate to orbicular-obovate, the base more or less cuneate..... 49. *M. Moricandiana*
- hh. Inflorescence strictly lateral; leaves orbicular-obovate to suborbicular, the base rounded, not cuneate. 50. *M. eximia*
- dd. Leaves membranaceous (see also *M. surinamensis*).
- e. Corolla-throat conical to campanulate.
- f. Plants more or less pubescent, at least the foliage; corolla 6–8 cm. long.
- g. Leaves sessile or subsessile; corolla-throat nearly as broad as long..... 51. *M. splendens*
- gg. Leaves long-petiolate; corolla-throat nearly twice as long as broad..... 52. *M. oblongifolia*
- ff. Plants glabrous; corolla 4–5 cm. long..... 53. *M. glabra*
- ee. Corolla-throat tubular.
- f. Corolla-limb about as long as the throat; leaves oblong-elliptic, cordate..... 54. *M. superba*
- ff. Corolla-limb much shorter than the throat; leaves linear to linear-lanceolate (infrequently oblong-elliptic in 55).
- g. Corolla 7–8 cm. long..... 55. *M. angustifolia*
- gg. Corolla about 3 cm. long..... 56. *M. minor*
- cc. Nodes exappendiculate, or essentially so, at least above.
- d. Corolla white, pinkish, or yellow, the limb reflexed or widely spreading.
- e. Leaves distinctly petiolate, the base cuneate to rounded, never deeply cordate and amplexicaul (occasionally obscurely cordate in 62–63).
- f. Corolla white or yellowish.
- g. Leaves membranaceous..... 57. *M. cereola*
- gg. Leaves coriaceous.

- h. Corolla 5-8 cm. long; calyx-lobes scarious.
- i. Corolla-throat conical to campanulate.
 - j. Corolla-throat conical-campanulate; calyx-lobes 0.5-0.6 cm. long 58. *M. fragrans*
 - jj. Corolla-throat strictly conical; calyx-lobes 0.2-0.3 cm. long 59. *M. permixta*
- ii. Corolla-throat subtubular to narrowly conical.
 - j. Plants glabrous.
 - k. Corolla-lobes 2-3 cm. long, about as long as the throat, conspicuously acuminate; plants of Bolivia and Ecuador 60. *M. boliviensis*
 - kk. Corolla-lobes 3.5-4.0 cm. long, longer than the throat, scarcely acuminate; plants of Venezuela.
 - 61. *M. bella*
 - jj. Plants scabrous to glabrate, minutely hirtellous when young; plants of Brazil 62. *M. Muelleri*
 - hh. Corolla 3.0-3.5 cm. long; calyx-lobes subfoliaceous 63. *M. lucida*
- ff. Corolla pink, at least the limb.
 - g. Corolla 5-9 cm. long, rich pink throughout, the lobes obovate, acuminate, as long as the throat or somewhat longer.
 - h. Corolla-throat conical; leaves glandular.
 - i. Leaves narrowly elliptic, the base somewhat cuneate, dark green above 64. *M. Sellowii*
 - ii. Leaves broadly oblong-elliptic, the base rounded or obscurely cordate, glaucous above 65. *M. Sanderi*
 - hh. Corolla-throat campanulate; leaves eglandular.
 - 66. *M. immaculata*
 - gg. Corolla 4.0-4.5 cm. long, the lobes pink, broadly obovate-reniform, scarcely acuminate, much shorter than the yellowish throat 67. *M. urophylla*
- ee. Leaves sessile or subsessile, the base deeply cordate and more or less amplexicaul 68. *M. venulosa*
- dd. Corolla reddish-purple, or the proper-tube reddish-purple and the throat and limb white or cream-colored, the limb erect or only slightly spreading.
 - e. Corolla dark reddish purple throughout, the lobes obliquely obovate to obovate-reniform 69. *M. atroviracea*
 - ee. Corolla-throat reddish violet, otherwise white or cream-colored, the lobes ovate-oblong to narrowly oblong-elliptic 70. *M. pendula*
- aa. Erect or ascending, suffrutescent herbs; inflorescence terminal, rarely subterminal.
 - b. Corolla-throat conical to campanulate, or if tubular-conical not narrowing toward the orifice.
 - c. Leaves coriaceous 71. *M. sancta*
 - cc. Leaves membranaceous to somewhat chartaceous.
 - d. Corolla rich pink or reddish; nectaries 2, essentially uniform and entire; plants of southeastern Brazil 72. *M. illustris*

- dd. Corolla pale pink or cream flushed with rose; nectaries 2-5, more or less dissimilar, and usually lobed when fewer than 5; plants of Bolivia and southern Peru..... 73. *M. cuspidata*
- bb. Corolla-throat tubular, slightly narrowing toward the orifice.
 - c. Corolla-throat relatively large, 2.75-5.0 cm. long, 0.75-1.25 cm. in diameter at the orifice.
 - d. Leaves ovate or obovate to ovate- or obovate-oblong.... 74. *M. velutina*
 - dd. Leaves linear..... 75. *M. linearis*
 - cc. Corolla-throat relatively small, 0.7-1.5 cm. long, 0.3-0.5 cm. in diameter at the orifice.
 - d. Corolla-throat about as long as the proper-tube..... 76. *M. coccinea*
 - dd. Corolla-throat much longer than the proper-tube.. 77. *M. spigeliaeiflora*

32. *Mandevilla oaxacana* (A. DC.) Hemsl. Biol. Centr.-Am. Bot. 2: 316. 1882.

Echites hirtella Humb. et Kunth, acc. to Benth. Pl. Hartw. 67. 1839, not HBK. Nov. Gen. 3: 213. 1819.

Echites Oaxacana A. DC. in DC. Prodr. 8: 451. 1844.

?*Echites cordata* A. DC. loc. cit. 1844.

Echites glaucescens Mart. & Gal. Bull. Acad. Roy. Brux. 11: 358. 1844.

Amblyanthera Oaxacana (A. DC.) Muell.-Arg. Linnaea 30: 447. 1860.

?*Temnadenia cordata* (A. DC.) Miers, Apoc. So. Am. 212. 1878.

Temnadenia glaucescens (Mart. & Gal.) Miers, loc. cit. 214. 1878.

Mesechites Oaxacana (A. DC.) Miers, loc. cit. 234. 1878.

Mesechites hirtellula Miers, loc. cit. 1878.

Mandevilla Schumanniana Loes. Bull. Herb. Boiss. 2: 556. 1894.

Suffruticose lianas; stems terete, relatively slender, glabrous; or infrequently sparsely and minutely pilosulose when young; leaves opposite, petiolate, lanceolate to ovate-lanceolate, apex acuminate, base rather obscurely cordate, 3-9 cm. long, 0.75-4.5 cm. broad, membranaceous, above glabrous, glandular at the base of the midrib, beneath sparsely and irregularly pilosulose to glabrate; petiole 0.5-2.0 cm. long; nodal appendages minute; inflorescence subterminal or lateral, alternate, simply racemose, about as long as the subtending leaves, bearing 3-8 rather distant, yellowish flowers; pedicels 0.75-1.25 cm. long; bracts lanceolate,

about 0.2 cm. long, scarious; calyx-lobes narrowly ovate-trigonal, acuminate, 0.2–0.3 cm. long, scarious, glabrous, the squamellae indefinitely distributed; corolla infundibuliform, glabrous without, the proper-tube straight, 0.8–1.2 cm. long, about 0.2 cm. in diameter at the base, the throat rather narrowly conical-campanulate, about as long as the proper-tube, about 0.75 cm. in diameter at the orifice, the lobes obliquely obovate, 0.5 cm. long, spreading; stamens inserted at the constriction of the corolla-tube, the anthers 0.4 cm. long, obscurely auriculate; ovary ovoid, about 0.2 cm. long, minutely pilose; stigma 0.3 cm. long; nectaries 5, compressed-oblongoid, as long as the ovary or somewhat longer; follicles somewhat falcate, relatively slender, obscurely articulated, 8–10 cm. long, glabrous; seeds 1.0 cm. long, the pale tawny coma of about equal length.

MEXICO: OAXACA: hills near Oaxaca, alt. 6000 ft., May 25, 1906, Pringle 13760 (C, G, S, US); hills, San Felipe de Agua, alt. 1800 ft., Sept. 1, 1895, Conzatti 578 (G); Cerro San Felipe, Aug., 1918, Reko 3955 (US); dry ledges of foothills above Oaxaca, alt. 6000 ft., May 29, 1894, Pringle 4662 (Bx, BM, G, MBG, NY); Puente de Gia, 1839, Hartweg 492 (BM, Camb., K); eastern cordillera of Oaxaca, alt. 7000 ft., date lacking, Galeotti 1582 (Bx, DL, K); prope Misla, Distr. Tlacolula, June, 1888, Seler & Seler 39 (B, BB, G); Rio Frio, June, 1842, Liebmamn 11981 (C, FM, US); Tehuantepec, in reg. mont., alt. 7000 ft., July, 1900, Gonzalez s. n. (V); exact locality lacking, April, 1834, Andrieux 248 (DC, TYPE, K).

33. *Mandevilla convolvulacea* (A. DC.) Hemsl. Biol. Centr.-Am. Bot. 2: 316. 1882.

Echites convolvulacea A. DC. in DC. Prodr. 8: 451. 1844,
not acc. to Miers, Apoc. So. Am. 195. 1878.

Amblyanthera convolvulacea (A. DC.) Muell.-Arg. Linnaea 30: 423. 1860.

Suffruticose lianas; stems terete, relatively slender, minutely puberulent when young, soon becoming glabrate; leaves opposite, petiolate, ovate to ovate-oblong, acuminate, broadly cordate, 8–12 cm. long, 3–7 cm. broad, membranaceous, above minutely puberulent when young, becoming sparsely hispidulous to glabrate, glandular at the base of the midrib, beneath densely puberulent to tomentulose, particularly along the veins; petiole 1.0–1.5 cm. long; nodal appendages minute; inflorescence lateral, simply racemose, conspicuously longer than the subtending leaves, bearing 10–15 secund, yellowish flowers; pedicels 0.8–1.25

cm. long; bracts narrowly lanceolate, 0.5–0.8 cm. long; calyx-lobes ovate-lanceolate, acuminate, 0.2–0.3 cm. long, scarious, glabrous or very sparsely pilosulose, the squamellae indefinitely distributed; corolla infundibuliform, glabrous without, the proper-tube straight, 0.3–0.4 cm. long, about 0.15 cm. in diameter at the base, not constricted at the insertion of the stamens, the throat conical, 0.5–0.7 cm. long, about 0.5 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 0.5 cm. long, widely spreading; anthers auriculate, 0.3–0.4 cm. long; ovary ovoid, about 0.1 cm. long, glabrous; nectaries 5, ovoid-oblongoid, about as long as the ovary; follicles unknown.

MEXICO: PUEBLA: Bartolo, in calidis, date lacking, Karwinski 269 (Bx); OAXACA: mountains, San Juan del Estado, alt. 7000 ft., Aug. 13, 1894, L. C. Smith 257 (G); Rio Blanco, San Juan del Estado, alt. 4500 ft., June 29, 1895, L. C. Smith 488 (G); Chiconemchitl, June, 1842, Liebmamn 11970 (C, FM, US); DATA INCOMPLETE: "Peruvia," Paxton s. n. (BB, TYPE, MBC, photograph and analytical drawings).

The error of ascribing a Peruvian origin to this species was pointed out by Mueller-Argoviensis (loc. cit. 1860). Nevertheless Miers (loc. cit. 1878) gives Peru and Bolivia as provenience of the species, citing *Mandon* 1472 from Sorata, Bolivia, a specimen more correctly referable to *M. Bridgesii* (Muell.-Arg.) Woodson.

34. *Mandevilla Andrieuxii* (Muell.-Arg.) Hemsl. Biol. Centr.-Am. Bot. 2: 316. 1882.

Amblyanthera Andrieuxii Muell.-Arg. Linnaea 30: 422. 1860.

Echites Andrieuxii (Muell.-Arg.) Miers, Apoc. So. Am. 206. 1878.

Mesechites Andrieuxii (Muell.-Arg.) Miers, loc. cit. 235. 1878.

Suffruticose lianas; stems relatively slender, terete, minutely puberulent when very young, soon becoming glabrate; leaves opposite, petiolate, narrowly obovate to obovate-lanceolate, apex acute to abruptly acuminate, base broadly obtuse to rounded, not cordate, 2–5 cm. long, 0.8–1.5 cm. broad, membranaceous, above puberulent to minutely and sparsely hispidulous, glandular at the base of the midrib, beneath densely puberulent to tomentulose; petiole 0.3–0.5 cm. long; nodal appendages minute; inflorescence lateral or subterminal, simply racemose, equalling

or slightly surpassing the length of the subtending leaves, bearing 8–12 lax, yellowish flowers; pedicels 0.8–1.0 cm. long; bracts narrowly lanceolate, 0.3–0.6 cm. long; calyx-lobes ovate-lanceolate, acuminate, 0.4–0.5 cm. long, scarious, sparsely puberulent, the squamellae indefinitely distributed; corolla infundibuliform, glabrous without, the proper-tube straight, 0.3–0.4 cm. long, about 0.15 cm. in diameter at the base, not constricted at the insertion of the stamens, the throat conical, 0.5–0.6 cm. long, about 0.6 cm. in diameter at the orifice, the lobes obliquely obovate, 3–4 cm. long, widely spreading; anthers auriculate, 0.4 cm. long; ovary ovoid, about 0.1 cm. long, glabrous; nectaries 5, ovoid-oblongoid, about as long as the ovary; follicles unknown.

MEXICO: OAXACA: San Francisco, inter Ilapan et Oaxacam, date lacking, *Andrieux* 249 (BB, DC, type, MBG, photograph and analytical drawings); Chiconesochitl, June, 1842, *Liebmamn* 11976 (C, FM).

35. *Mandevilla equatorialis* Woodson, Ann. Mo. Bot. Gard. 19: 65. 1932.

Suffruticose lianas; stems terete, relatively slender, minutely puberulent when young, soon becoming glabrate; leaves opposite, petiolate, ovate-oblong, apex rather abruptly acuminate, base broadly and obscurely cordate, 2–5 cm. long, 1.0–1.25 cm. broad, firmly membranaceous, above minutely puberulent to glabrate, glandular at the base of the midrib, beneath densely and minutely tomentulose; petiole 0.3–0.7 cm. long; nodal appendages minutely pectinate; inflorescence lateral or subterminal, alternate, simply racemose, about twice as long as the subtending leaves, bearing 8–14 yellowish flowers; pedicels 0.4 cm. long; bracts lanceolate, 0.2–0.3 cm. long, scarious; calyx-lobes lanceolate, acuminate, 0.2 cm. long, minutely puberulent-papillate, the squamellae in alternate groups of 3–5; corolla infundibuliform, minutely puberulent-papillate without, the proper-tube straight, 0.2 cm. long, about 0.1 cm. in diameter at the base, the throat narrowly conical, 0.5–0.7 cm. long, about 0.4 cm. in diameter at the orifice, the lobes obliquely obovate-lanceolate, acuminate, 0.3 cm. long, spreading; stamens inserted at the base of the corolla-throat, the anthers truncate, 0.3–0.4 cm. long; ovary ovoid, about 0.1

cm. long, glabrous; nectaries 5, compressed-obovoid, about half as long as the ovary; mature follicles unknown.

ECUADOR: vicinity of Tablon de Oña, Sept. 27, 1918, Rose Pachano & Rose 23029 (US, TYPE, MBG, photograph and analytical drawings).

36. *Mandevilla albo-viridis* (Rusby) Woodson, Ann. Mo. Bot. Gard. 19: 69. 1932.

Dipladenia alba-viridis Rusby, Descr. So. Am. Pl. 86. 1920.
Suffruticose lianas; stems terete, relatively stout, minutely and sparsely puberulent when very young, soon becoming glabrate; leaves opposite, petiolate, ovate- to oblong-elliptic, apex abruptly acuminate, base broadly and rather obscurely cordate, 6-11 cm. long, 2.5-7.0 cm. broad, firmly membranaceous, above glabrous, glandular at the base of the midrib, beneath minutely puberulent-tomentulose, particularly along the veins and midrib; petiole 1.5-2.5 cm. long; nodal appendages 0.1-0.2 cm. long, coriaceous; inflorescence lateral, alternate, simply racemose, about half as long as the subtending leaves, bearing 3-5 lax, greenish-white flowers toward the end of the peduncle; pedicels 1.25 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-lanceolate, narrowly acute, 0.3 cm. long, scarious, glabrous, the squamellae in alternate groups of 3-6; corolla infundibuliform, glabrous without or essentially so, the proper-tube straight, 0.7-0.8 cm. long, about 0.15 cm. in diameter at the base, the throat narrowly conical, 1.5-1.75 cm. long, about 0.7 cm. in diameter at the orifice, the lobes obliquely obovate, acuminate, 1.2-1.5 cm. long, spreading; anthers truncate, 0.8 cm. long; ovary oblongoid, 0.3 cm. long, glabrous; nectaries (? 2-) 5, compressed-oblongoid, about half as long as the ovary; follicles unknown.

COLOMBIA: MAGDALENA: damp forest and neglected clearings, Sierra del Libano, alt. 6000 ft., Jan. 22, 1899, H. H. Smith 1904 (NY, TYPE, MBG, photograph and analytical drawings).

37. *Mandevilla veraguensis* (Seem.) Hemsl. Biol. Centr.-Am. Bot. 2: 317. 1882 (as *M. veraguensis*).

Echites (§ *Euechites*) *Veraguensis* Seem. Bot. Voy. Herald, 168. 1852; Miers, Apoc. So. Am. 203. 1878.

Mandevilla Loesneriana K. Sch. in Engl. Bot. Jahrb. 25: 725. 1898.

Suffruticose lianas; stems terete, relatively stout, sparsely and minutely pilose when young, soon becoming glabrate; leaves opposite, petiolate, broadly ovate to ovate-elliptic, apex shortly acuminate, base broadly cordate, 5–13 cm. long, 2.5–7.0 cm. broad, firmly membranaceous, above glabrous, or rarely minutely puberulent to glabrate, glandular at the base of the midrib, beneath minutely pilose to glabrate, occasionally glabrous; petiole 1.0–2.5 cm. long; nodal appendages 0.05–0.1 cm. long, slightly coriaceous; inflorescence lateral, alternate, simply racemose, about as long as the subtending leaves, bearing 5–12 lax, purplish flowers; pedicels 2–3 cm. long; bracts lanceolate, 0.2–0.3 cm. long, scarious; calyx-lobes ovate-trigonal, acute, 0.3–0.6 cm. long, scarious, glabrous, the squamellae in alternate groups of 6–8; corolla infundibuliform, glabrous to minutely and densely puberulent-papillate without, the proper-tube straight, 2.0–2.5 cm. long, about 0.2 cm. in diameter at the base, the throat rather broadly conical-campanulate, 1.5–2.0 cm. long, about 1 cm. in diameter at the orifice, the lobes obliquely obovate, acuminate, 2.5–3.0 cm. long, spreading; anthers truncate, 0.7 cm. long; ovary ovoid-oblongoid, about 0.3 cm. long; nectaries 5, compressed-obovoid, truncate or somewhat emarginate, somewhat less than half as long as the ovary; follicles unknown.

COSTA RICA: CARTAGO: Turrialba, 1845–48, Ørsted 15510 (C); LIMON: San Pedro de la Calabaza, alt. 1100 m., July 26, 1888, Pittier 369 (Bx, US).

PANAMA: CHIRIQUI: Boquete, March, 1848, Seemann 1220 (BM, K, TYPE); forests around El Boquete, alt. 1000–1300 m., March, 1911, Pittier 3147 (FM, US); LOS SANTOS: along Rio Caldera, March 16, 1911, Pittier 3147 (FM).

COLOMBIA: JURADO: open trail, La Cumbre, Dept. El Valle, alt. 1600–1800 m., Sept. 11–19, 1922, Killip 11409 (G, K, US); TOLIMA: Azufral del Quindio, Prov. Mariquita, alt. 2150 ft., July, 1853, Triana s. n. (BM); CAUCA: Juza, Popayan, alt. 1400–1800 m., Jan., year lacking, Lehmann 8483 (FM, K).

VENEZUELA: MERIDA: prope coloniam Tovar, 1854–55, Fendler 1028 (BB, Bx, K, MBG).

ECUADOR: PICHINCHA: in fruticeto ad marg. viae, Tandapi, July 11, 1920, Holmgren 846 (S); GUAYAS: Teresita, 3 km. west of Bucay, alt. 270 m., July 5–7, 1923, Hitchcock 20495 (NY, US).

It is doubtful whether the minutely puberulent corolla-lobes of *M. Loesneriana* should entitle it to specific recognition. Hitchcock 20495 from the province of Guayas, Ecuador, bears corollas densely and generally velutinous without, but the construction of the flowers, as well as the vegetative characters, appears

scarcely separable from more typical specimens of *M. veraguensis* from Colombia, Venezuela, and the type locality in northern Panama. It is possible that the recognition of a variety might satisfy our knowledge of existing specimens.

38. *Mandevilla glandulosa* (R. & P.) Woodson, Ann. Mo. Bot. Gard. 19: 66. 1932.

Echites glandulosa R. & P. Fl. Peruv. 2: 19. pl. 135. 1799;
Miers, Apoc. So. Am. 196. 1878.

Prestonia peruviana Spreng. Syst. 1: 637. 1825.

Haemadictyon glandulosum (R. & P.) A. DC. in DC. Prodr. 8: 427. 1844.

Odontaderia glandulosa (R. & P.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 169. 1895.

Suffruticose lianas; stems terete, relatively stout, softly pubescent when young, becoming glabrate; leaves opposite, petiolate, ovate to broadly ovate-lanceolate, apex acuminate, base broadly cordate, 10–15 cm. long, 6–8 cm. broad, membranaceous, above puberulent when young, becoming glabrate, glandular at the base of the midrib, beneath densely tomentulose; petiole 1.5–2.0 cm. long; nodal appendages 0.1–0.3 cm. long, somewhat coriaceous; inflorescence lateral, opposite or potentially so, simply racemose, about twice as long as the leaves, bearing 15–20 lax, greenish-white or cream-colored flowers; pedicels 3.0–3.5 cm. long; bracts lanceolate, 0.3–0.4 cm. long, scarious; calyx-lobes lanceolate, acuminate, 0.5–0.6 cm. long, scarious, puberulent, the squamellae in alternate groups of 2–4; corolla infundibuliform, glabrous or minutely papillate without, the proper-tube straight, 2.0–2.25 cm. long, about 0.2 cm. in diameter at the base, the throat narrowly conical, 1.5–1.75 cm. long, about 0.5 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2 cm. long, spreading; anthers emarginate, 0.6 cm. long; ovary ovoid-oblongoid, 0.3 cm. long, minutely puberulent-papillate; nectaries 5, compressed-ovoid, truncate, about 0.1 cm. long; follicles stout, continuous or very slightly articulate, glabrous, 30–35 cm. long; seeds not seen.

PERU: ad Mufías, date lacking, *Pavon s. n.* (BB, TYPE, MBG, photograph and analytical drawings); Yanano, alt. about 6000 ft., May 13–16, 1923, *Macbride* 5730 (FM); exact locality and date lacking, *Weberbauer* 4384 (B).

39. *Mandevilla subcordata* Rusby, Bull. N. Y. Bot. Gard. 4: 315. 1907.

Suffruticose lianas; stems terete, relatively stout, puberulent to glabrate; leaves opposite, petiolate, broadly ovate- to oblong-elliptic, apex abruptly acuminate, base broadly cordate, rarely obtuse or rounded, 4-10 cm. long, 2.5-5.0 cm. broad, membranaceous, above glabrous or very minutely puberulent when young, glandular at the base of the midrib, beneath densely and minutely tomentulose to glabrate; petiole 1.0-2.5 cm. long; nodal appendages relatively inconspicuous; inflorescence lateral, alternate, simply racemose, about twice as long as the subtending leaves, bearing 5-20 lax, greenish-white or cream-colored flowers; pedicels 1.0-1.25 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-lanceolate, 0.5-0.7 cm. long, scarious, minutely puberulent to glabrate, the squamellae in alternate groups of 4-6; corolla infundibuliform, glabrous without, the proper-tube straight, 1.5-2.0 cm. long, about 0.15 cm. in diameter at the base, the throat rather narrowly conical, 2.0-2.25 cm. long, about 1 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 1.5 cm. long, spreading; anthers auriculate, 0.5 cm. long; ovary ovoid-oblongoid, 0.2 cm. long, glabrous; nectaries 5, compressed-obvoid, truncate or obscurely emarginate, about 0.1 cm. long; follicles relatively stout, continuous, 20-30 cm. long, glabrous; seeds about 0.75 cm. long, the pale tawny coma about 2 cm. long.

BOLIVIA: LA PAZ: near snow-line, Mt. Tunari, 1891, Bang 1190 (C, FM, NY, type, US, MBG, photograph and analytical drawings); Yungas, alt. 4000 ft., 1885, Rusby 2394 (NY).

40. *Mandevilla Bridgesii* (Muell.-Arg.) Woodson, Ann. Mo. Bot. Gard. 19: 67. 1932.

Amblyanthera Bridgesii Muell.-Arg. Linnaea 30: 420. 1860;
Miers, Apoc. So. Am. 189. 1878.

Mandevilla Mandoni Britton, Bull. Torrey Bot. Club 25: 496. 1898.

Mandevilla Bangii Rusby, Bull. N. Y. Bot. Gard. 4: 315.
1907.

Suffruticose lianas; stems terete, relatively stout, glabrous or essentially so; leaves opposite, petiolate, ovate to broadly

oblong-elliptic, apex acuminate, base broadly cordate, 3-12 cm. long, 1.5-7.0 cm. broad, membranaceous, above glabrous or very minutely and sparsely puberulent when very young, glandular at the base of the midrib, beneath generally puberulent or tomentulose throughout; petiole 1-3 cm. long; nodal appendages 0.05-0.2 cm. long, somewhat coriaceous; inflorescence lateral, alternate, simply racemose, about as long as the subtending leaves or somewhat longer, bearing 4-12 lax, white or cream-colored flowers; pedicels 1.5-2.0 cm. long; bracts lanceolate, 0.2-0.5 cm. long, scarious or slightly foliaceous; calyx-lobes narrowly oblong-lanceolate, acuminate, 0.75-1.0 cm. long, slightly foliaceous, glabrous or very sparsely and minutely puberulent, the squamellae in alternate groups of 6-8; corolla infundibuliform, glabrous without or very minutely papillate, the proper-tube straight, 0.5-0.7 cm. long, about 0.2 cm. in diameter at the base, the throat tubular-conical, 1.2-2.0 cm. long, about 0.4 cm. in diameter at the orifice, the lobes obliquely obovate to obovate-oblong, shortly acuminate, 1.5-2.0 cm. long; anthers obscurely auriculate, 0.8 cm. long; ovary ovoid-oblongoid, about 0.3 cm. long, glabrous; stigma 0.3-0.4 cm. long; nectaries 5, compressed-ovoid, truncate or somewhat depressed, about 0.1 cm. long; follicles relatively stout, continuous, 15-30 cm. long, glabrous; seeds about 0.7 cm. long, the pale tawny coma about 2 cm. long.

PERU: CUZCO: Ollantetambo, Urubamba Valley, alt. 2800 m., Febr., 1931, *Herrera* 3123 (FM, MBG, US).

BOLIVIA: LA PAZ: Sorata, alt. 7500 ft., Sept. 4, 1901, *Williams* 2427 (BM, K, NY); same locality, April 19, 1920, *Holway & Holway* 566 (NY, US); Prov. Larecaja, viciniis Sorata, in nemoribus, undique, alt. 2500-3000 m., May 9, 186-, *Mandon* 1472 (BB, BM, K, NY, S); Sorata, alt. 8000 ft., Febr., 1886, *Rusby* 2386 (B, BM, Bx, FM, K, MBG, NY, US); COCHABAMBA: vicinity of Cochabamba, 1891, *Bang* 1065 (B, BM, DL, FM, K, MBG, V, US); same locality and date, *Bang* 1120 (K, MBG, NY); Quebrada de Pocona, alt. 2800 m., Dec. 17, 1921, *Lillo* 5988 (B); Pocona, alt. 2500 m., Nov. 8, 1928, *Steinbach* 8662 (FM); TARIJA: Tucumilla bei Tarija, alt. 3000 m., Dec. 30, 1903, *Fiebrig* 2455 (AA, B, BM); DATA INCOMPLETE: *Bridges* s. n. (BB, TYPE, Camb., MBG, photograph).

With the accumulation of additional specimens, this species may be found to intergrade with the following, which it closely approaches in some instances.

41. *Mandevilla laxa* (R. & P.) Woodson, Ann. Mo. Bot. Gard. 19: 68. 1932.

Echites laxa R. & P. Fl. Peruv. 2: 19. pl. 134. 1799; A. DC. in DC. Prodr. 8: 451. 1844; Miers, Apoc. So. Am. 197. 1878.

Mandevilla suaveolens Lindl. Bot. Reg. n. s. 3: pl. 7. 1840; Miers, loc. cit. 184. 1878.

Echites suaveolens (Lindl.) A. DC. loc. cit. 452. 1844, not Mart. & Gal.

Amblyanthera suaveolens (Lindl.) Muell.-Arg. Linnaea 30: 447. 1860.

Mandevilla Tweediana Gadeceau & Stapf, Bull. Soc. Sci. Ouest Fr. III. 3: 2. 1913.

Suffruticose lianas; stems terete, relatively stout, glabrous, or minutely puberulent when very young; leaves opposite, petiolate, ovate, apex acuminate, base broadly cordate, 6–15 cm. long, 3–6 cm. broad, membranaceous, above glabrous, glandular at the base of the midrib, beneath barbate in the axils of the midrib, otherwise glabrous; petiole 2–3 cm. long; nodal appendages 0.5–0.8 cm. long, somewhat coriaceous; inflorescence lateral, alternate, simply racemose, conspicuously longer than the subtending leaves, bearing 5–15 white or cream-colored flowers; pedicels 1.5–2.0 cm. long; bracts lanceolate, 0.5–0.7 cm. long, scarious or slightly foliaceous; calyx-lobes lanceolate, acuminate, 0.7–1.25 cm. long, somewhat foliaceous, glabrous, the squamellae in alternate groups of 4–6, or indefinitely distributed; corolla infundibuliform, glabrous without, the proper-tube straight, 1.0–2.5 cm. long, about 0.2 cm. in diameter at the base, the throat conical, 1.5–3.0 cm. long, 0.7–1.0 cm. in diameter at the orifice, the lobes obliquely obovate, 1.5–3.0 cm. long; anthers obscurely auriculate, 1.0–1.2 cm. long; ovary ovoid-oblongoid, about 0.4 cm. long, glabrous; stigma 0.4–0.5 cm. long; nectaries 5, compressed-obovoid, truncate, about 0.1 cm. long; follicles relatively stout, continuous, 25–40 cm. long, glabrous; seeds about 0.6 cm. long, the pale tawny coma about 1.5 cm. long.

BOLIVIA: TARIJA: Toldos, bei Bermejo, alt. 1900 m., Dec. 4, 1903, Fiebrig 2336 (AA, B, BM, G, K, S); Huayavilla, Nov., 1905, Fiebrig 2153 (B).

ARGENTINA: TUCUMAN: Tucuman, Jan. 7, 1873, Lorentz & Hieronymus s. n. (B);

El Pesutito, Dept. Burroyaco, Nov. 22, 1928, *Venturi* 7586 (MBG, US); Chaearita de los Padres, Nov. 21-24, 1872, *Lorentz & Hieronymus* 403 (B); en los alrededores de la ciudad de Tucuman, Jan. 7, 1873, *Hieronymus & Lorentz s. n.* (B); Piambon, Sierra de Tucuman, March, 1872, *Lorentz* 205 (B); abundant in woods of Tucuman, 1840, *Tweedie s. n.* (K); SANTIAGO DEL ESTERO: Esquina Grande, Dec. 10, 1916, *Jørgensen* 1800 (MBG, US).

As far as may be ascertained, the type specimen, or at any rate a specimen which might be construed as typical, does not exist of Ruiz & Pavon's *Echites laxa*. The only two species to which this name can be applied, however, are *Mandevilla suaveolens* Lindl. and *Amblyanthera Bridgesii* Muell.-Arg. Of these, the former has not been collected in Peru, according to the available records, whereas the latter has been collected in southern Peru at least once within recent times. Both species are relatively frequent in Bolivia, however, whence it is possible that Pavon obtained his specimen. Since we must rely upon the figure given in the 'Flora Peruviana,' we find that *M. suaveolens* agrees more closely with this figure, which is characterized by the larger corolla, with correspondingly shorter calyx-lobes of the Lindleyan species.

42. *Mandevilla grata* Woodson, Ann. Mo. Bot. Gard. 19: 68. 1932.

Suffruticose lianas; stems terete, relatively slender, glabrous, or minutely puberulent when young; leaves opposite, petiolate, ovate, acuminate, broadly cordate, 7-12 cm. long, 5-9 cm. broad, membranaceous, above glabrous or minutely puberulent when very young, beneath barbate in the axils of the midrib; petiole 2.0-3.5 cm. long; nodal appendages relatively inconspicuous; inflorescence lateral, alternate, simply racemose, about twice as long as the subtending leaves, bearing 4-12 white or cream-colored flowers toward the end of the peduncle; pedicels 1.5-2.0 cm. long; bracts lanceolate, 0.5-1.0 cm. long, scarious to slightly foliaceous; calyx-lobes narrowly oblong-lanceolate, acuminate, 1 cm. long, somewhat foliaceous, glabrous, the squamellae in alternate groups of 3-5; corolla infundibuliform, glabrous or minutely papillate without, the proper-tube straight, about 1 cm. long, about 0.3 cm. in diameter at the base, the throat tubular-conical, 1.0-1.2 cm. long, 0.4-0.5 cm. in diameter at the

orifice, the lobes obliquely obovate, 0.5–0.7 cm. long, ascending or slightly spreading; anthers obscurely auriculate, 0.8–0.9 cm. long; ovary oblongoid, about 0.2 cm. long, glabrous; stigma 0.3 cm. long; nectaries 5, ovoid-reniform, about half as long as the ovary; follicles unknown.

ARGENTINA: TUCUMAN: Mufecas, March 5, 1923, Venturi 1769a (BA, MBG, TYPE); Alto de la Polvora, March 28, 1922, Venturi 1769 (BA, MBG).

43. *Mandevilla funiformis* (Vell.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 171. 1895.

Echites funiformis Vell. Fl. Flum. 109. 1830; Icon. 3: pl. 29. 1827.

Echites microphylla Stadelm. Flora 24¹: Beibl. 35. 1841.

Amblyanthera funiformis (Vell.) Muell.-Arg. in Mart. Fl. Bras. 6¹: 144. 1860.

Amblyanthera funiformis (Vell.) Muell.-Arg. α . *peduncularis* Muell.-Arg. loc. cit. 1860.

Amblyanthera funiformis (Vell.) Muell.-Arg. β . *brevipedunculata* Muell.-Arg. loc. cit. 1860.

Amblyanthera funiformis (Vell.) Muell.-Arg. γ . *microphylla* (Stadelm.) Muell.-Arg. loc. cit. pl. 44. 1860.

Echites Ganabarica Casaretto, ex Muell.-Arg. loc. cit. 1860, nom. nud. in synon.

Amblyanthera funiformis (Vell.) Muell.-Arg. δ . *arenaria* Muell.-Arg. loc. cit. 1860.

Echites arenaria Salzm. ex Muell.-Arg. loc. cit. 1860, nom. nud. in synon.

Mitozus exilis Miers, Apoc. So. Am. 218. pl. 31. 1878.

Mitozus Guanabericus (Casar.) Miers, loc. cit. 1878, err. typ.

Mitozus funiformis (Vell.) Miers, loc. cit. 219. 1878.

Mitozus microphylla (Stadelm.) Miers, loc. cit. 1878.

Mandevilla funiformis (Vell.) K. Sch. var. *peduncularis* (Muell.-Arg.) Malme, Bihang till K. Sv. Vet. Akad. Handl. Afd. III. 24¹⁰: 23. 1899.

Suffruticose lianas; stems terete, relatively slender, glabrous; leaves opposite, petiolate, ovate to ovate-lanceolate, acuminate, broadly cordate, 2.5–6.0 cm. long, 1.0–4.5 cm. broad, firmly membranaceous, glabrous, glandular at the base of the midrib

above; petiole 0.5–1.0 cm. long; nodal appendages minute; inflorescence lateral, alternate, simply racemose, conspicuously longer than the subtending leaves, bearing 5–12 lax, yellowish flowers; pedicels 2.0–2.25 cm. long; bracts lanceolate, 0.1–0.2 cm. long, scarious; calyx-lobes broadly trigonal, acute, 0.1 cm. long, scarious, glabrous, the squamellae solitary, opposite, trigonal; corolla infundibuliform, glabrous without, the proper-tube straight, 1.0–1.5 cm. long, about 0.3 cm. in diameter at the base, the throat campanulate, 1.25–2.0 cm. long, about 1.0–1.5 cm. in diameter at the orifice, the lobes obliquely obovate, 1.5–2.0 cm. long, spreading; anthers obscurely auriculate, 0.7 cm. long; ovary ovoid, 0.3 cm. long, glabrous; nectaries 5, compressed-obovoid, 0.1 cm. long; follicles relatively slender, obscurely articulated, 10–15 cm. long, glabrous; seeds 0.7 cm. long, the brilliant tawny coma about 1.5 cm. long.

BRAZIL: PARAHYBA: Parahiba, 1825, *Videnfis s. n.* (Bx); BAHIA: Maracas, Sept., 1906, Ule 6988 (B, K); berge bei Calderão, Oct., 1906, Ule 6988b (B); Bahia, in sabulosis aridis, 1830, Salzmann 318 (DC); MINAS GERAES: Organ Mts., March, 1838, Miers 4029 (BM); RIO DE JANEIRO: near Mage, March, 1837, Gardner 538 (K); same locality, date lacking, Miers 3436 (BM); Cabo Frio, 1815, Pohl 15 (Bx); Mage, 1839, Schott 5404 (Bx); Petropolis, 1910, Luetzelburg s. n. (B); Therezopolis, April, 1895, Ule 3335 (B); Rio de Janeiro, date lacking, Sellow 169 (K, NY); Glaziou 8170 (B, C, K); Glaziou 7754 (B, C); 1836, Vauthier s. n. (DC); SÃO PAULO: Rio Cubatão, in silva fluminali, Dec. 28, 1911, Dusen 13708 (MBG, S, US); near Cubatão (at Rio-das-Pedras); in Mr. Smith's Cítio and immediate vicinity, Dec. 8, 1826, Burchell 3482 (Bx); in a walk from Santos to São Vicente, on the road, Oct. 23, 1826, Burchell 3303 (Bx); Santos, date lacking, Sellow 791 (B); Santos, in margin silv. littoralis, Febr. 10, 1875, Moser 3193 (S); PARANA: Volta Grande, in fruticetis, Nov. 5, 1908, Dusen 6988 (S, US); Campo Grande, Serra do Mar, alt. 800 m., Nov. 1913, Brade 6700 (B); Morretes opp., in silvula, July 16, 1911, Dusen 11928 (S); DATA INCOMPLETE: Sellow 217 (Bx); Riedel 60 (B); Riedel 61 (B, BB, G).

44. *Mandevilla Luetzelburgii* (Ross & Mgf.) Woodson, comb. nov.

Dipladenia Luetzelburgii Ross & Mgf. Notizblatt 9: 396. fig. 8. 1925.

Suffruticose lianas; stems terete or very slightly compressed, relatively stout, softly puberulent when young, eventually glabrate or somewhat scabrous; leaves opposite, petiolate, ovate-elliptic, apex acuminate, base obtuse to obscurely cordate, 5–6 cm. long, 2.0–2.5 cm. broad, coriaceous or subcoriaceous, above

velutinous, glandular at the base of the midrib, beneath minutely and densely tomentulose; petiole 0.2–0.3 cm. long; nodal appendages 0.3–0.8 cm. long, unguiculate and coriaceous when fully developed; inflorescence lateral, alternate, simply racemose, about as long as the subtending leaves, bearing 8–10 rose-pink flowers; pedicels 0.5–0.7 cm. long; bracts ovate, 0.2–0.3 cm. long, scarious; calyx-lobes lanceolate, acuminate, 0.4–0.5 cm. long, scarious, sparsely puberulent-papillate, the squamellae in alternate groups of 4–6; corolla infundibuliform, puberulent-papillate without, the proper-tube straight, 1.25–1.5 cm. long, about 0.15 cm. in diameter at the base, the throat conical, 1.2–1.4 cm. long, about 1 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2 cm. long, spreading; anthers auriculate, 0.8 cm. long; ovary oblongoid, 0.2 cm. long, glabrous; nectaries 5, compressed-oblongoid, very unequal, $\frac{1}{3}$ – $\frac{1}{2}$ as long as the ovary; follicles relatively stout, continuous, about 14 cm. long, glabrous; seeds 0.7 cm. long, the pale tawny coma about 1.25 cm. long.

BRAZIL: ESPÍRITO SANTO: Serra Pintoba, urwald am Rio Doce, Febr., 1917, Luetzelburg 7155 (B, M, TYPE, MBG, photograph and analytical drawings).

This species furnishes one of the most cogent arguments in favor of consolidating *Dipladenia* with *Mandevilla*, having been assigned to the former only because of its pronounced affinity with *D. Martiana* (Stadelm.) A. DC. regardless of the fact that the number of nectaries, two in the former instance and five in the latter, is the only expressible distinction between the two genera. This dilemma, strongly indicative of artificial generic criteria, is not exceptional, however. In *D. cuspidata* Rusby, the number of nectaries is evidently quite inconstant, varying from two to five among individuals from the same general locality and not infrequently under the same collector's number. The same situation obtains in *D. congesta* (HBK.) K. Sch. In *D. Achrestogyne* Woodson, the nectaries, numbering from two to four, are so inconspicuous that they must be dissected from between the tissues of the ovary and the receptacle to be observed. In *Echites Bogotensis* HBK. and *E. macrophylla* A. Zalbr., of strongly pronounced affinity with the foregoing species, the nectaries have apparently degenerated without a trace.

Unless each newly found variation in number, or absence of the nectaries is to be seized upon as the basis for a new genus, it appears obvious that the generic importance of the number, or even presence of these vestigial organs must be minimized in generic segregation. Consequently the genus *Dipladenia* A. DC. has been consolidated with *Mandevilla* Lindl. to form an obviously natural aggregate.

45. *Mandevilla callista* Woodson, spec. nov.

Suffrutices volubiles ut dicitur ca. 3-8 m. alti; ramulis teretibus in sicco plus minusve angulosis compressis cortice flavo-brunneis sparse lenticellatis glabris; foliis oppositis longe petiolatis late ovatis apice abrupte angusteque acuminatis basi late cordatis 10-14 cm. longis 6-10 cm. latis membranaceis supra atroviridibus glabris nervo medio in longitudinem sparse sed conspicue glanduloso subtus pallidioribus venis venuisque minute puberulis; petiolo 5.0-6.5 cm. longo glabro; nodiis obscure 4-appendiculatis; inflorescentiis lateralibus alternatis racemosis simplicibus foliis aequantibus vel paululo superantibus floras ut dicitur plus minusve 30 speciosas suaveolentes prope apicem pedunculi gerentibus; pedicellis 1.5-2.0 cm. longis post maturitatem paulo accrescentibus; bracteis scariaceis minimis caducis; calycis laciniiis ovato-deltoideis latissime obtusis 0.25 cm. longis scariaceis minute papillatis margine ciliolatis intus basi irregulariter multiglanduligeris; corollae infundibuliformis extus glabrae vel minutissime papillatae tubo proprio recto haud gibboso 1.5 cm. longo basi ca. 0.35 cm. diametro metiente prope apicem gradatim constricto albido faucibus anguste conicis 2 cm. longis ostio ca. 0.7-0.8 cm. diametro metiente albidis lobis ovato-dolabiformibus 2.5-3.0 cm. longis patulis basi albidis deinde roseis margine crenulatis aeneis; antheris auriculatis 0.8 cm. longis; ovario ovoideo ca. 0.175 cm. longo glabro; stigmate 0.2 cm. longo obscure apiculato; nectariis 5 compresse reniformibus carnosis plus minusve connatis ovario vix aequantibus; folliculis ignotis.

Suffruticose lianas said to attain a height of 3-8 m.; branches terete, more or less angular in desiccation, yellowish-brown, sparsely lenticellate, glabrous; leaves opposite, long-petiolate, broadly ovate, apex abruptly and narrowly acuminate, base

broadly cordate, 10–14 cm. long, 6–10 cm. broad, membranaceous, above dark green, glabrous, sparsely but conspicuously glandular along the midrib, beneath paler, minutely puberulent along the veins; petiole 5.0–6.5 cm. long; nodes obscurely 4-appendiculate; inflorescence lateral, alternate, simply racemose, about equalling or very slightly surpassing the leaves, bearing about 30 fragrant, showy flowers toward the end of the peduncle; pedicels 1.5–2.0 cm. long, slightly accrescent after maturity; bracts scarious, minute, caducous; calyx lobes ovate-deltoid, very broadly obtuse, 0.25 cm. long, scarious, minutely papillate without, margin ciliolate, the squamellae numerous, indefinitely distributed; corolla infundibuliform, glabrous without, the proper-tube straight, not gibbous, 1.5 cm. long, about 0.35 cm. in diameter at the base, gradually constricting toward the insertion of the stamens, white, the throat narrowly conical, 2 cm. long, about 0.7–0.8 cm. in diameter at the orifice, white or pale cream-colored, the lobes ovate-dolabriform, 2.5–3.0 cm. long, widely spreading, base white, "shading to a light rose, then to a dark rose, and the fringes are crenellated and a dark bronze;" anthers auriculate, 0.8 cm. long; ovary ovoid, about 0.175 cm. long, glabrous; stigma 0.2 cm. long, obscurely apiculate; nectaries 5, compressed-reniform, fleshy, more or less connate at the base, somewhat shorter than the ovary; follicles unknown.

COLOMBIA: BOYACA: El Humbo, 130 m. north of Bogota, forest fringes at brookside, alt. 3000 ft., March 25, 1933, Lawrence 710 (FM, TYPE, MBG, photograph and analytical drawings).

This species is of particular significance, as it combines the floral characters of subgen. *Eumandevilla* sect. *Lazae* with the foliar character of subgen. *Exostemon*. The aspect of the living plants has been carefully observed by the collector of the type specimen, from whom the description of the flower color has been quoted in the preceding paragraphs. Mr. Lawrence also reports "A very beautiful vine indeed. Each flower stem appears to carry thirty buds, more or less, and they bloom and fall singly." The Colombian popular name for the plant is reported to be "Bejuca," widely applied to other South American lianas of the Apocynaceae.

46. **Mandevilla Martiana** (Stadelm.) Woodson, comb. nov.
Suffruticose lianas; stems terete or very slightly compressed, relatively stout; leaves opposite, very shortly petiolate to sessile, oblong to broadly oblong-elliptic, apex abruptly acuminate to obtuse, base broadly and rather obscurely cordate, 5–10 cm. long, 3.0–4.5 cm. broad, coriaceous, glandular at the base of the midrib above; nodal appendages 0.2–0.7 cm. long, coriaceous and reflexed when fully developed; inflorescence lateral, alternate, simply racemose, about twice as long as the subtending leaves, bearing 3–8 rosy-red flowers toward the distal half of the peduncle; pedicels 1.5–2.0 cm. long; bracts ovate-lanceolate, 0.5–0.7 cm. long, scarious; calyx-lobes narrowly ovate-lanceolate, long-acuminate, 0.7–1.0 cm. long, scarious, the squamellae in alternate groups of 8–10; corolla infundibuliform, glabrous without, the proper-tube straight, 2.0–2.75 cm. long, about 0.2 cm. in diameter at the base, the throat broadly conical to campanulate, 2.7–3.0 cm. long, about 1.75–2.0 cm. in diameter at the orifice, the lobes obliquely obovate, 3.5–4.0 cm. long, widely spreading; anthers auriculate, 0.7–0.8 cm. long; ovary oblongoid, about 0.2 cm. long, glabrous; stigma 0.15 cm. long, obscurely apiculate; nectaries 2, compressed-oblongoid, about half as long as the ovary; follicles unknown.

Var. *typica*

Echites Martiana Stadelm. Flora 24¹: Beibl. 31. 1844.

Dipladenia Martiana (Stadelm.) A. DC. in DC. Prodr. 8: 485. 1844; Muell.-Arg. in Mart. Fl. Bras. 6¹: 127. 1860; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 169. 1895.

Dipladenia Martiana (Stadelm.) A. DC. *a. pubescens* Muell.-Arg. loc. cit. 128. 1860.

Micradenia hirsutula Miers, Apoc. So. Am. 160. 1878.

Micradenia Martiana (Stadelm.) Miers, loc. cit. 161. 1878. Stems scabrous-hirtellous to glabrate; leaves bullate-scabrous above, puberulent-pilosulose beneath; all other essential characters as in the species.

BRAZIL: BAHIA: Itacolumi, Febr., 1839, *Martius* 909 (M, Bx); ad Villa Novam da Mainho, April, year lacking, *Martius* 300 (M, TYPE, MBG, photograph and analytical drawings); MINAS GERAES: Sabara, date lacking, *Claussen* s. n. (V).

Var. *glabra* (Muell.-Arg.) Woodson, comb. nov.

Dipladenia Martiana (Stadelm.) A. DC. *β. glabra* Muell.-
Arg. loc. cit. 128. 1860.

Dipladenia acuminata Hook. Bot. Mag. III. 11: pl. 4828.
1855; Muell.-Arg. loc. cit. 129. 1860.

Plants essentially glabrous throughout; all other characters as
in the species.

BRAZIL: MINAS GERAES: Serra da Piedade, Jan. 30, 1866, Engle s. n. (C, MBG,
photograph); same locality and date, Warming s. n. (C); CULTIVATED: Herb. Royal
Botanic Gardens, Kew (K, MBG, photograph).

It appears unavoidable to recognize these varieties because of
the conspicuous diversity in their vegetative surfaces. Reasons
for rejecting the genus *Dipladenia* will be found on page 699.

47. *Mandevilla crassinoda* (Gardn.) Woodson, comb. nov.

Echites crassinoda Gardn. ex Hook. Lond. Jour. Bot. 1:
544. 1842.

Dipladenia crassinoda (Gardn.) A. DC. in DC. Prodr. 8:
486. 1844; Muell.-Arg. in Mart. Fl. Bras. 6¹: 132. 1860.

Micradenia crassinoda (Gardn.) Miers, Apoc. So. Am. 158.
1878.

Suffruticose lianas; stems terete or somewhat compressed,
relatively stout; leaves opposite, shortly petiolate, narrowly
elliptic to linear, apex narrowly acute to acuminate, base attenu-
ate, 5–8 cm. long, 1–3 cm. broad, coriaceous, glabrous, the upper
surface glandular at the base of the midrib; petiole 0.5–1.0 cm.
long; nodal appendages 0.1–0.3 cm. long, coriaceous, ovoid-
reniform when fully developed; inflorescence lateral or subter-
minal, simply racemose, about half as long as the subtending
leaves, bearing 2–3 white or cream-colored flowers toward the
end of the peduncle; pedicels 1.0–1.25 cm. long; bracts ovate,
0.2–0.4 cm. long, scarious; calyx-lobes ovate, acute to acuminate,
0.4–0.5 cm. long, scarious, glabrous, the squamellae in alternate
groups of 6–8; corolla infundibuliform, glabrous without, the
proper-tube straight, 0.7–1.0 cm. long, about 0.2 cm. in diameter
at the base, the throat narrowly conical to subtubular, 2.0–2.5
cm. long, about 0.8 cm. in diameter at the orifice, the lobes
obliquely obovate, scarcely acuminate, 2.0–2.5 cm. long, widely

spreading; anthers auriculate, 0.9 cm. long; ovary oblongoid, about 0.2 cm. long, glabrous; stigma 0.2 cm. long, obscurely apiculate; nectaries 2, compressed-obovoid, about half as long as the ovary; follicles relatively slender, continuous, 10 cm. long, glabrous; seeds not examined.

BRAZIL: RIO DE JANEIRO: Mt. Corvocado, date lacking, Gardner 250 (K, type, MBG, photograph); Forteresse, Pic de Santa Cruz, Aug. 7, 1872, Glaziou 5943 (C, K, MBG, photograph and analytical drawings); exact locality and date lacking, Glaziou 8171 (C).

In this species, as in several of its close relatives, there is not a sharp distinction between the suberect, and the typically twining habit characteristic of the majority of Mandevillas. As confusing as this variability may prove to be in the case of herbarium studies, it serves to accentuate the fallibility of habitual distinctions when used as generic criteria in the Echitoideae of the western hemisphere.

48. *Mandevilla surinamensis* (Pulle) Woodson, comb. nov.

Dipladenia surinamensis Pulle, Rec. Trav. Bot. Néerl. 6: 286. 1909.

Dipladenia upatae Woodson, Ann. Mo. Bot. Gard. 18: 545. 1931.

Suffruticose or suffrutescent lianas; stems terete, relatively slender, occasionally sparsely and minutely pilosulose at the nodes, otherwise glabrous; leaves opposite, petiolate, oblong to obovate-elliptic, apex abruptly acuminate, base obtuse to obscurely cordate, 4–8 cm. long, 2.5–5.0 cm. broad, coriaceous or subcoriaceous, glabrous, the upper surface glandular at the base of the midrib; petiole 0.5–1.0 cm. long; nodal appendages 0.1–0.4 cm. long, coriaceous and reflexed when fully developed; inflorescence lateral, alternate, simply racemose, somewhat shorter than the subtending leaves, or about as long, bearing 3–7 white or cream-colored flowers toward the distal half of the peduncle; pedicels 0.5–0.7 cm. long; bracts minutely ovate, scarious; calyx-lobes lanceolate, acuminate, 0.4–0.5 cm. long, scarious, glabrous, the squamellae in alternate pairs; corolla infundibuliform, glabrous without, the proper-tube straight, 1.7–2.0 cm. long, about 0.15 cm. in diameter at the base, the throat subtubular, 1.5–1.8 cm. long, about 0.5 cm. in diameter

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at the orifice, the lobes obliquely obovate, shortly acuminate, 2.5 cm. long, widely spreading; anthers auriculate, 0.7 cm. long; ovary oblongoid, about 0.3 cm. long, glabrous; stigma 0.25 cm. long, obscurely apiculate; nectaries 2, compressed-ovoid, about $\frac{1}{6}$ as long as the ovary; follicles relatively stout, continuous, about 15 cm. long, glabrous; seeds unknown.

VENEZUELA: BOLIVAR: Upata, date lacking, *Osta* 1014 (V, MBG, photograph and analytical drawings).

DUTCH GUIANA: fluv. Litanie, sup. prope Mount Knopaiamoi, Dec., 1903, *Versteeg* 382 (U, TYPE, MBG, photograph and analytical drawings); fluv. Suriname, exact locality lacking, Jan. 10, 1908, *Tresling* 407 (U).

49. *Mandevilla Moricandiana* (A. DC.) Woodson, comb. nov.

Echites obovata Nees, ex Steud. Nom. ed. 2. 1: 540. 1841.

Suffruticose or suffrutescent lianas, frequently suberect; stems terete or very slightly compressed, relatively slender; leaves opposite, petiolate, broadly obovate to orbicular-obovate, apex very abruptly acuminate to subcuspidate, base abruptly narrowed to the petiole, 1.5–2.5 cm. long, 1.25–2.5 cm. broad, coriaceous, upper surface glandular at the base of the midrib; petiole 0.2–0.3 cm. long; nodal appendages 0.1–0.15 cm. long, coriaceous when fully developed; inflorescence subterminal, simply racemose, about twice as long as the subtending leaves, bearing 3–5 yellowish or rose-colored flowers; pedicels 0.5 cm. long; bracts ovate-lanceolate, 0.2–0.3 cm. long; calyx-lobes lanceolate, acuminate, 0.3 cm. long, scarious, the squamellae in alternate groups of 4–6; corolla infundibuliform, glabrous without, the proper-tube straight, 1.5 cm. long, about 0.1 cm. in diameter at the base, the throat tubular or subtubular, 1.25–1.5 cm. long, about 0.5 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 1.25–1.5 cm. long, widely spreading; anthers auriculate, 0.8 cm. long, glabrous; stigma 0.2 cm. long, rather obscurely apiculate; nectaries 2, compressed-ovoid, slightly emarginate, nearly as long as the ovary; follicles slender, continuous, 10–12 cm. long, glabrous; seeds 0.75 cm. long, the pale tawny coma 1.5 cm. long.

Var. *typica*.

Dipladenia Moricandiana A. DC. in DC. Prodr. 8: 486. 1844; Muell.-Arg. in Mart. Fl. Bras. 6¹: 129. 1860.

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Micradenia Moricandiana A. DC. ex Miers, Apoc. So. Am.
162. 1878.

Plants essentially glabrous throughout; stems occasionally minutely puberulent or pilosulose at the nodes; all other essential characters as in the species.

BRAZIL: BAHIA: Corral de Battuba, 1815, *Vindensia* 3131 (M); exact locality and date lacking, *Blanchet* 1679 (M); Tocaja, date lacking, *Mikan s. n.* (V); RIO GRANDE DO NORTE: near Natal, July, 1914, *Dawe* 30 (K).

Var. *bahiensis* Woodson, var. nov., ab varietate typica foliis ramulisque velutino-pilosis differt.

Stems and leaves velutinous-pilose; all other essential characters as in the species.

BRAZIL: BAHIA: Serra do Sincora, Nov., 1906, *Ule* 7121 (K, TYPE, MBG, photograph and analytical drawings).

Were it not for the well-known variability of indument and leaf outline of the South American "Dipladenias," one might be persuaded to employ Ule's specimen as the basis for a distinct species. More ample material of *M. Moricandiana* vars. *typica* and *bahiensis* is greatly to be desired.

50. *Mandevilla eximia* (Hemsl.) Woodson, comb. nov.

Dipladenia eximia Hemsl. Gard. Chron. III. 14: 120. 1893.

Suffruticose or suffrutescent lianas; stems terete, relatively slender, softly puberulent when young, eventually glabrate; leaves opposite, petiolate, suborbicular to orbicular-obovate, apex very abruptly acuminate to cuspidate, base rounded, 3-4 cm. long, 1.75-3.0 cm. broad, coriaceous, glabrous, the upper surface obscurely glandular at the base of the midrib; petiole 0.3-0.5 cm. long; nodal appendages rather inconspicuous, subcoriaceous and reflexed when fully developed; inflorescence lateral, alternate, simply racemose, about twice as long as the subtending leaves, bearing 4-6 rose-colored flowers; pedicels 0.5 cm. long; bracts ovate-lanceolate, acuminate, 0.2 cm. long, scarious; calyx-lobes narrowly lanceolate, acuminate, 0.4 cm. long, scarious, glabrous, the squamellae indefinitely distributed; corolla infundibuliform, glabrous without, the proper-tube straight, 1.25-1.5 cm. long, about 0.1 cm. in diameter at the base, the throat narrowly conical to subtubular, 1.5-1.75 cm. long,

about 0.5 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2.5–3.0 cm. long, widely spreading; anthers auriculate, 0.7 cm. long; ovary ovoid-oblongoid, about 0.1 cm. long, glabrous; stigma 0.15 cm. long, obscurely apiculate; nectaries 2, compressed-oblongoid, nearly as long as the ovary; follicles unknown.

Unfortunately this species is known only from horticulture. It was originally imported from Brazil, probably from the vicinity of Santa Catharina, according to a letter to Sir J. D. Hooker from the importers, Sander & Co., introducers of several other tropical Apocynaceous plants for "stove" culture in the latter part of the past century. The plants thus imported were brought to blossom in 1893, and a specimen sent to Hooker. A specimen was also brought to flower at Kew in 1899, and an admirable plate drawn from it and published in the 'Botanical Magazine,' pl. 7720. 1899. Both specimens are preserved in the herbarium of the Royal Botanic Gardens, Kew.

M. eximia is very closely related to *M. Moricandiana* (A. DC.) Woodson, differing chiefly in the nearly orbicular leaves with rounded, not cuneate, bases, and the strictly lateral racemes. It is hoped that native collections will soon be forthcoming.

51. *Mandevilla splendens* (Hook.) Woodson, comb. nov.

Echites splendens Hook. f. Bot. Mag. N. S. 16: pl. 3976.
1843.

Dipladenia splendens (Hook.) A. DC. in DC. Prodr. 8: 676.
1844; Muell.-Arg. in Mart. Fl. Bras. 6¹: 130. 1860.

Micradenia splendens (Hook.) A. DC. ex Miers, Apoc. So.
Am. 163. 1878.

Suffruticose lianas; stems terete, relatively stout, puberulent-pilosulose, eventually becoming glabrate; leaves opposite, sessile or subsessile, broadly elliptic to oblong-elliptic, apex acuminate, base broadly and rather obscurely cordate, 12–20 cm. long, 6.0–7.5 cm. broad, membranaceous, above minutely pilose-hispidulous, glandular at the base of the midrib, beneath minutely puberulent-tomentulose; petiole 0.5 cm. long to virtually obsolete; nodal appendages dentiform-flagelliform, becoming somewhat coriaceous at maturity; inflorescence lateral, alternate, simply

racemose, about as long as the subtending leaves, bearing 3-5 showy, pink flowers; pedicels 1.25-1.5 cm. long; calyx-lobes ovate-lanceolate, acuminate, 0.5-0.75 cm. long, scarious, essentially glabrous, the squamellae in alternate groups of 6-8; corolla infundibuliform, glabrous without, the tube straight, 0.75-1.0 cm. long, about 0.15 cm. in diameter at the base, the throat broadly conical to campanulate, 2.0-2.5 cm. long, about 1.5-2.0 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 3-4 cm. long, widely spreading; anthers auriculate, 0.7 cm. long; ovary ovoid-oblongoid, about 0.15 cm. long, glabrous; stigma 0.2 cm. long, obscurely apiculate; nectaries 2(-4), compressed-ovoid, nearly as long as the ovary; follicles unknown.

BRAZIL: RIO DE JANEIRO: Organ Mts., date lacking, Lobb s. n. (K, TYPE, MBG, photograph and analytical drawings).

This species is one of the numerous *Dipladenia*s introduced into cultivation by Sander & Co. in the past century. It is the only species ordinarily seen in cultivation at the present time.

52. *Mandevilla oblongifolia* Woodson, comb. nov.

Dipladenia oblongifolia Woodson, Ann. Mo. Bot. Gard. 18: 544. 1931.

Suffruticose or suffrutescent lianas; stems relatively slender, terete, densely puberulent to glabrate; leaves opposite, petiolate, broadly oblong-elliptic, apex shortly acuminate, base rather obscurely cordate, 7-15 cm. long, 2-4 cm. broad, membranaceous, above minutely and densely puberulent to glabrate, glandular at the base of the midrib, beneath densely and minutely puberulent; petiole 2-3 cm. long; nodal appendages 0.2-0.4 cm. long, somewhat coriaceous when fully developed; inflorescence lateral, alternate, simply racemose, equaling or somewhat surpassing the subtending leaves, bearing 3-8 showy, white or cream-colored flowers; pedicels 0.5-1.0 cm. long; bracts scarious, minute; calyx-lobes narrowly ovate-lanceolate, acuminate, 0.5-0.7 cm. long, scarious, puberulent to glabrate, the squamellae in alternate groups of 4-8; corolla infundibuliform, glabrous without, the proper-tube straight, 1.5-1.75 cm. long, about 0.15 cm. in diameter at the base, the throat conical, 2.5 cm. long, about 1.5

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cm. in diameter at the orifice, the lobes obliquely obovate, acuminate, 3.0–3.5 cm. long, widely spreading; anthers auriculate, 0.7 cm. long; ovary ovoid-oblongoid, about 0.1 cm. long, glabrous; stigma 0.2 cm. long, obscurely apiculate; nectaries 2, compressed-ovoid, somewhat shorter than the ovary; follicles unknown.

BOLIVIA: LA PAZ: La Florida, vec. de Yanocochi, alt. 1700 m., Dec. 6, 1906, *Buchtien* 590 (US, TYPE, MBG, photograph and analytical drawings); Milluhuaya, alt. 1300 m., Dec, 1917, *Buchtien* 4088 (G, US); same data, *Buchtien* 4140 (G, US).

53. *Mandevilla glabra* (Rusby) Woodson, comb. nov.

Dipladenia glabra Rusby, Descr. So. Am. Pl. 88. 1920.

Suffruticose or suffrutescent lianas; stems terete, relatively slender, glabrous; leaves opposite, petiolate, oblong to oblong-elliptic, apex rather abruptly acuminate, base abruptly and rather obscurely cordate, 4–7 cm. long, 2–3 cm. broad, membranaceous, glabrous, glandular at the base of the midrib above; petiole 1.0–1.5 cm. long; nodal appendages flagelliform to flagelliform-dentiform; inflorescence lateral, alternate, simply racemose, about as long as the subtending leaves, bearing 2–5 showy, cream-colored or pinkish flowers; pedicels 1.0–1.5 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-lanceolate, acuminate, 0.3–0.4 cm. long, scarious, glabrous, the squamellae in alternate groups of 2–4; corolla infundibuliform, glabrous without, the proper-tube straight, 1.0–1.25 cm. long, about 0.1 cm. in diameter at the base, the throat rather narrowly conical, 1.25–1.5 cm. long, about 0.75–1.0 cm. in diameter at the orifice, lobes obliquely obovate, acuminate, 2.0–2.25 cm. long, widely spreading; anthers auriculate, 0.7 cm. long; ovary ovoid, about 0.15 cm. long; stigma 0.2 cm. long, obscurely apiculate; nectaries 2, compressed-ovoid, about half as long as the ovary; follicles relatively slender, obscurely articulated to subcontinuous, 10–14 cm. long; seeds unknown.

BOLIVIA: LA PAZ: Cotaña, am Illimani, alt. 2450 m., Nov., 1911, *Buchtien* 3229 (G, NY, TYPE, US, MBG, photograph and analytical drawings); same locality, Dec. 9, 1876, *Stübel* 56 (B); base of Mt. Illimani, Rio Palca valley, La Granja, alt. 2600 m., Dec., 1923, *Julio* 128 (US); same locality, date lacking, *Julio* 15 (US).

**54. *Mandevilla superba* Herzog, in Fedde, Rep. Sp. Nov. 7:
65. 1909.**

Essentially glabrous, suffruticose or suffrutescent lianas; stems terete, relatively slender; leaves opposite, shortly petiolate, oblong-elliptic, apex rather abruptly acuminate, base gradually narrowed and rather obscurely cordate, 4–6 cm. long, 1–3 cm. broad, membranaceous, glandular at the base of the midrib above; petiole 0.5–0.75 cm. long; nodal appendages 0.2–0.5 cm. long, reflexed-unguiculate, coriaceous when fully developed; raceme simple, lateral, alternate, somewhat longer than the subtending leaves, bearing 3–5 showy, cream-colored or pinkish flowers; pedicels 0.75 cm. long; bracts minutely ovate-lanceolate, scarious; calyx-lobes ovate-lanceolate, acuminate, 0.6 cm. long, the squamellae in alternate groups of 6–8; corolla infundibuliform, glabrous without, the proper-tube straight, 1.25–1.5 cm. long, about 0.15 cm. in diameter at the base, the throat broadly tubular, 3.5–4.0 cm. long, about 1.5 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 3.0–3.5 cm. long, widely spreading; anthers auriculate, 0.7 cm. long; ovary oblong-oid, about 0.15 cm. long, glabrous; stigma 0.2 cm. long, obscurely apiculate; nectaries 2, compressed-ovoid, about $\frac{1}{4}$ as long as the ovary; follicles unknown.

BOLIVIA: POTOSI: in der Cactus- u. Dornbusch region zw. Pampa-Grande u. Pulquina, alt. 1700 m., Dec., 1907, Herzog 742 (B, TYPE, MBG, photograph and analytical drawings).

55. *Mandevilla angustifolia* (Malme) Woodson, comb. nov.

Dipladenia angustifolia Malme, Bull. Herb. Boiss. II. 4: 258. 1904.

Glabrous, suffruticose lianas; stems terete or slightly compressed, relatively stout; leaves opposite, shortly petiolate, linear to linear-lanceolate, infrequently oblong-elliptic, apex long-acuminate, base obtuse, not cordate, 6–15 cm. long, 0.5–4.0 cm. broad, membranaceous, glandular at the base of the midrib above; petiole 0.2–0.5 cm. long; nodal appendages reflexed-unguiculate to dentiform-flagelliform, coriaceous when fully developed; inflorescence lateral, alternate, simply racemose, usually somewhat shorter than the subtending leaves, bearing 3–15 showy, cream- or rose-colored flowers; pedicels 0.75–1.0 cm. long; bracts ovate-lanceolate, 0.1–0.3 cm. long, scarious;

calyx-lobes ovate-lanceolate, acuminate, 0.4–0.5 cm. long, scarios, the squamellae in alternate groups of 8–10, or indefinitely distributed; corolla infundibuliform, glabrous without, the proper-tube straight, 0.75–1.0 cm. long, about 0.2 cm. in diameter at the base, the throat broadly tubular, 4.0–4.25 cm. long, about 1 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2.5–2.75 cm. long, widely spreading; anthers auriculate, 0.8 cm. long; ovary ovoid, about 0.15 cm. long, glabrous; stigma 0.2 cm. long, obscurely apiculate; nectaries 2, compressed-ovoid, nearly as long as the ovary; follicles relatively slender, continuous, 13–20 cm. long, glabrous; seeds 1 cm. long, the brilliant tawny coma 3 cm. long.

PARAGUAY: prope Concepcion, Aug., 1901, Hassler 7204 (AA, BB, TYPE, G, K, B); Gran Chaco, exact locality lacking, date lacking, Pride s. n. (K).

ARGENTINA: TUCUMAN: Cerro del Campo, alt. 1000 m., Dec., 1928, Venturi 7757 (MBG).

56. *Mandevilla minor* Woodson, spec. nov.

Suffrutices volubiles; ramulis teretibus gracilibus glabris; foliis oppositis breviter petiolatis linearibus apice acuminatis basi obtusis haud cordatis 3–10 cm. longis 0.25–0.75 cm. latis membranaceis omnino glabris nervo medio ventro basi pauciglanduliger; petiolo ca. 0.5 cm. longo; appendiculis interpetiolaribus 0.1–0.3 cm. longis maturitate coriaceis reflexis; inflorescentiis lateralibus alternatis racemosis simplicibus quam foliis paulo brevioribus florulas speciosas albidas 3–5 prope partem superiorem pedunculi laxe gerentibus; pedicellis 0.5 cm. longis; bracteis ovatis scariaceis minimis; calycis lacinias ovato-lanceolatis acuminatis 0.2–0.3 cm. longis scariaceis glabris intus basi in marginibus 4–8-glanduligeris; corollae infundibuliformis extus omnino glabrae tubo proprio recto haud gibboso 0.3 cm. longo basi ca. 0.1 cm. diametro metiente faucibus tubulosis 1.75–2.0 cm. longis ostio ca. 0.5 cm. diametro metiente lobis oblique obovatis acutis 0.6–0.7 cm. longis patulis; antheris auriculatis 0.6 cm. longis; ovario ovoideo ca. 0.2 cm. longo glabro; stigmate 0.2 cm. longo obscure apiculato; nectariis 2 anguste ovoideis ovario subaequantibus; folliculis crassiusculis continuis 15–20 cm. longis glabris; seminibus ca. 1 cm. longis como aurantiaco ca. 2.5 cm. longo.

Glabrous, suffruticose lianas; stems terete, relatively slender; leaves opposite, shortly petiolate, linear, apex acuminate, base abruptly obtuse, not cordate, 3–10 cm. long, 0.25–0.75 cm. broad, membranaceous, sparsely glandular at the base of the midrib above; petiole 0.5 cm. long; nodal appendages 0.1–0.3 cm. long, reflexed-unguiculate, coriaceous when fully mature; inflorescence lateral, alternate, simply racemose, somewhat shorter than the subtending leaves, bearing 3–5 showy, white or cream-colored flowers; pedicels 0.5 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-lanceolate, acuminate, 0.2–0.3 cm. long, scarious, the squamellae in alternate groups of 4–8; corolla infundibuliform, glabrous without, the proper-tube straight, 0.3 cm. long, about 0.1 cm. in diameter at the base, the throat tubular, 1.75–2.0 cm. long, about 0.5 cm. in diameter at the orifice, the lobes obliquely obovate, acute, 0.6–0.7 cm. long, only slightly spreading; anthers auriculate, 0.6 cm. long; ovary ovoid, about 0.2 cm. long, glabrous; stigma 0.2 cm. long, obscurely apiculate; nectaries 2, compressed-ovoid, nearly as long as the ovary; follicles relatively stout, continuous, 15–20 cm. long, glabrous; seeds 1 cm. long, the brilliant tawny coma 2.5 cm. long.

ARGENTINA: FORMOSA: exact locality lacking, Jan., 1919, Jørgensen 2605 (G, MBG, TYPE).

57. *Mandevilla cereola* Woodson, spec. nov.

Suffrutices volubiles; ramulis teretibus gracilibus glabris; foliis oppositis petiolatis anguste ellipticis vel elliptico-oblanceolatis apice acuminatis basi gradatim attenuatis haud cordatis, 6–10 cm. longis 2.0–3.5 cm. latis membranaceis omnino glabris supra eglandulosis; petiolo 1.5–2.0 cm. longo; nodis ut videntur exappendiculatis; inflorescentiis lateralibus alternatis racemosis simplicibus quam foliis subtendentibus ca. dimidio brevioribus floras albidas 2–6 laxe gerentibus; pedicellis 0.8–1.0 cm. longis; bracteis ovatis scarriaceis minimis; calycis laciniis ovato-lanceolatis acuminatis 0.4–0.5 cm. longis scarriaceis glabris intus basi in marginibus 4–6-glanduligeris; corollae infundibuliformis extus glabrae tubo proprio recto 1.5–1.75 cm. longo basi ca. 0.2 cm. diametro metiente faucibus conicis 2.5–2.75 cm. longis ostio ca. 1.5 cm. diametro metiente lobis oblique obovatis acuminatis

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2.75–3.0 cm. longis patulis; antheris auriculatis 1 cm. longis; ovario oblongideo ca. 0.3 cm. longo glabro; stigmate 0.3 cm. longo obscure apiculato; nectariis 2 anguste ovoideis ovario ca. ter brevioribus; folliculis gracilibus continuis 12–15 cm. longis glabris; seminibus 0.8 cm. longis como dilute aurantiaco ca. 2 cm. longo.

Glabrous, suffruticose lianas; stems terete, relatively slender; leaves opposite, petiolate, narrowly elliptic to elliptic-ob lanceolate, acuminate, base rather gradually attenuate, 6–10 cm. long, 2.0–3.5 cm. broad, membranaceous, eglandular above; petiole 1.5–2.0 cm. long; nodal appendages obsolete, at least above; racemes simple, lateral, alternate, about one-half as long as the subtending leaves, bearing 2–6 showy, white or cream-colored flowers; pedicels 0.8–1.0 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-lanceolate, acuminate, 0.4–0.5 cm. long, scarious, the squamellae in alternate groups of 4–6; corolla infundibuliform, glabrous without, the proper-tube straight, 1.5–1.75 cm. long, about 0.2 cm. in diameter at the base, the throat conical, 2.5–2.75 cm. long, about 1.5 cm. in diameter at the orifice, lobes obliquely obovate, acuminate, 2.75–3.0 cm. long, widely spreading; anthers auriculate, 1 cm. long; ovary oblongoid, 0.3 cm. long, glabrous; stigma 0.3 cm. long, obscurely apiculate; nectaries 2, compressed-ovoid, about one-third as long as the ovary; follicles relatively slender, continuous, 12–15 cm. long, glabrous; seeds 0.8 cm. long, the pale tawny coma 2 cm. long.

ECUADOR: CHIMBORAZO: Huigra vicinity, Sept. 8, 1918, Rose & Rose 22592 (US).

BOLIVIA: LA PAZ: San Carlos, alt. 600 m., Jan. 29, 1927, Buchten 1737 (US, TYPE, MBG, photograph and analytical drawings).

This species is easily distinguishable from *M. boliviensis*, with which it has been confused, by means of its conical corolla-throat and membranaceous foliage.

58. *Mandevilla fragrans* (Stadelm.) Woodson, comb. nov.

Echites fragrans Stadelm. Flora 24¹: Beibl. 71. 1841.

Dipladenia fragrans (Stadelm.) A. DC. in DC. Prodr. 8: 483. 1844; Muell.-Arg. in Mart. Fl. Bras. 6¹: 130. pl. 39. 1860.

Dipladenia fragrans (Stadelm.) A. DC. *a. oppositifolia* Muell.-Arg. loc. cit. 131. 1860.

Dipladenia fragrans (Stadelm.) A. DC. *s. ternatifolia* Muell.-Arg. loc. cit. 1860.

Dipladenia Riedelii Muell.-Arg. loc. cit. 1860.

Micradenia Riedelii (Muell.-Arg.) Miers, Apoc. So. Am. 160. 1878.

Micradenia fragrans (Stadelm.) Miers, loc. cit. 162. 1878.

Glabrous, suffruticose or suffrutescent lianas, occasionally suberect; stems relatively terete, stout; leaves opposite or rarely ternate, petiolate, broadly oblong to obovate-elliptic, apex abruptly acuminate to subcaudate-acuminate, base obtuse to rounded, 6–10 cm. long, 3–5 cm. broad, coriaceous, sparsely glandular at the base of the midrib above; petiole 1.25–2.0 cm. long; nodal appendages obsolete or extremely inconspicuous, at least above, occasionally conspicuous and coriaceous below; racemes simple, lateral, alternate, about equalling or somewhat longer than the subtending leaves, bearing 3–8 showy, white or cream-colored flowers; pedicels 1.25–1.5 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-lanceolate, long-acuminate, 0.5–0.6 cm. long, scarious, the squamellae in alternate groups of 6–8; corolla infundibuliform, glabrous without, the proper-tube straight, 1.0–1.25 cm. long, about 0.15 cm. in diameter at the base, the throat broadly conical-campanulate, 2.25–3.0 cm. long, about 1.5 cm. in diameter at the orifice, the lobes obliquely obovate, acuminate, 2–3 cm. long, suberect to widely spreading; anthers auriculate, 0.8 cm. long; ovary oblongoid, about 0.15 cm. long, glabrous; stigma 0.15 cm. long, obscurely apiculate; nectaries 2, compressed-obovoid, about one-third as long as the ovary; follicles unknown.

BRAZIL: MINAS GERAES: exact locality and date lacking, Pohl (M, TYPE, Bx, MBG, photograph and analytical drawings); RIO DE JANEIRO: exact locality lacking, Jan., 1897, Ule 5829 (B, US); DATA INCOMPLETE: Riedel s. n. (B, MBG, photograph); Glaziou 11187 (C); Glaziou 7755 (C); Glaziou 4086 (C).

The type specimen of *Dipladenia Riedelii* Muell.-Arg. (*Riedel s. n.* in Hb. Berol.) differs from that of *Echites fragrans* Stadelm. (*Pohl s. n.* in Hb. Monac.) in a somewhat smaller corolla with slightly shorter, more erect lobes. This character appears to intergrade among other specimens, and consequently has not been considered of specific, or even of varietal importance.

59. *Mandevilla permixta* Woodson, spec. nov.

Suffrutices volubiles; ramulis teretibus crassiusculis glabris; foliis oppositis petiolatis late ellipticis vel obovato-ellipticis apice abrupte breviterque caudato-acuminatis basi late obtusis vel rotundatis 4–7 cm. longis 2.5–4.0 cm. latis coriaceis omnino glabris nervo medio ventro basi pauciglanduligero; petiolo 1.0–1.25 cm. longo; nodiis superioribus exappendiculatis inferioribus appendiculas conspicuas coriaceasque munitis; inflorescentia lateralibus alternatis racemosis simplicibus floras albidas 3–8 laxe gerentibus; pedicellis 1.25–1.5 cm. longis; bracteis ovatis scariaceis minimis; calycis laciniis ovatis acutis vel late acuminatis 0.2–0.3 cm. longis scariaceis glabris intus basi in marginibus 4–6-glanduligeris; corollae infundibuliformis extus glabrae tubo proprio recto 1.5–1.75 cm. longo basi ca. 0.15 cm. diametro metiente faucibus late conicis 2.0–2.25 cm. longis ostio 1.5–1.75 cm. diametro metiente lobis oblique obovatis breviter acuminatis 2.5–3.0 cm. longis patulis; antheris auriculatis 0.7 cm. longis; ovario oblongoideo ca. 0.2 cm. longo glabro; stigmate 0.2 cm. longo obscure apiculato; nectariis 2, anguste obovoideis ovario ca. ter brevioribus; folliculis ignotis.

Glabrous, suffruticose or suffrutescent lianas; stems relatively stout, terete; leaves opposite, petiolate, the blade broadly elliptic to obovate-elliptic, abruptly and shortly caudate-acuminate, base broadly obtuse to rounded, 4–7 cm. long, 2.5–4.0 cm. broad, coriaceous, sparsely glandular at the base of the midrib above; petiole 1.0–1.25 cm. long; stipular appendages obsolete or extremely inconspicuous above, conspicuous and coriaceous below; racemes simple, lateral, alternate, the peduncle somewhat shorter than the subtending leaves, bearing 3–8 white or cream-colored flowers; pedicels 1.25–1.5 cm. long; bracts minutely ovate, caducous; calyx-lobes ovate, acute to broadly acuminate, 0.2–0.3 cm. long, scarious, the squamellae in alternate groups of 4–6; corolla infundibuliform, glabrous without, the proper-tube cylindrical, straight, 1.5–1.75 cm. long, about 0.15 cm. in diameter at the base, the throat rather broadly conical, 2.0–2.25 cm. long, about 1.5–1.75 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2.5–3.0 cm. long, widely spreading; anthers auriculate, 0.7 cm. long; ovary oblongoid, about 0.2 cm.

long, glabrous; stigma 0.2 cm. long, obscurely apiculate; nectaries 2, compressed-obovoid, about one-third as long as the ovary; follicles unknown.

BRAZIL: BAHIA: exact locality and date lacking, *Blanchet* 3960 (C, M, MBG, TYPE, K).

This species differs from *M. fragrans*, with which it has been confused, in the strictly conical corolla-throat, which is nearly as long as the proper-tube, and in the much shorter calyx-lobes. With few exceptions the construction of the corolla and the relative length of calyx-lobes are conspicuous and apparently reliable specific criteria throughout the genera of American Echitoideae.

60. *Mandevilla boliviensis* (Hook. f.) Woodson, comb. nov.

Dipladenia boliviensis Hook. f. Bot. Mag. III. 25: pl. 5783. 1869.

Glabrous, suffruticose lianas; stems terete, relatively stout; leaves opposite, petiolate, elliptic to obovate-elliptic, apex caudate-acuminate, base obtuse, 6–10 cm. long, 2.0–4.25 cm. broad, coriaceous, sparsely glandular at the base of the midrib above, rarely eglandular; petiole 1.0–1.75 cm. long; nodal appendages obsolete or extremely inconspicuous, at least above; racemes simple, lateral, alternate, somewhat shorter than the subtending leaves, bearing 3–7 showy, white flowers; pedicels 1.5–2.0 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-lanceolate, acuminate, 0.4–0.5 cm. long, scarious, the squamellae in alternate groups of 4–6; corolla infundibuliform, glabrous without, the proper-tube straight, 1.5–1.75 cm. long, about 0.15 cm. in diameter at the base, the throat narrowly conical, 2.25–2.5 cm. long, about 0.75–1.0 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2–3 cm. long, widely spreading; anthers auriculate, 1 cm. long; ovary oblongoid, 0.2 cm. long, glabrous; stigma 0.2 cm. long, obscurely apiculate; nectaries 2, compressed-obovoid, about one-half as long as the ovary; follicles unknown.

ECUADOR: TUNGURAHUA: Rio Pastaza, between Baños and Mera, alt. 4000 ft., 1924, Tate 669 (US).

BOLIVIA: exact locality and date lacking, Pearce 708 (K, TYPE, MBG, photograph and analytical drawings).

61. *Mandevilla bella* (Pittier) Woodson, comb. nov.

Dipladenia bella Pittier, Jour. Wash. Acad. Sci. 21: 141.
1931.

Glabrous, suffruticose lianas; stems terete, relatively stout; leaves opposite, petiolate, obovate-elliptic, apex abruptly acuminate, base cuneate, rather narrowly obtuse to acute, 8–11 cm. long, 4–5 cm. broad, coriaceous, sparsely glandular at the base of the midrib above; petiole 1.5–2.0 cm. long; nodal appendages obsolete or extremely inconspicuous above; racemes simple, lateral, alternate, about half as long as the subtending leaves, bearing 3–7 showy, white flowers; pedicels 2 cm. long; bracts minutely ovate, scarious; calyx-lobes broadly ovate, acute, 0.2–0.3 cm. long, scarious, the squamellae in alternate groups of 4–6; corolla infundibuliform, glabrous without, the proper-tube straight, 1.5–1.75 cm. long, about 0.2 cm. in diameter at the base, the throat narrowly conical or tubular-conical, 2.0–2.25 cm. long, about 1 cm. in diameter at the orifice, the lobes obliquely obovate, scarcely acuminate, 3.5–4.0 cm. long, widely spreading; anthers auriculate, 1 cm. long; ovary oblongoid, gradually produced into the style, 0.3 cm. long, glabrous; stigma 0.25 cm. long, shortly apiculate; nectaries 2, ovoid-reniform, about one-third as long as the ovary; follicles unknown.

VENEZUELA: DISTRITO FEDERAL: hacienda Puerto la Cruz, Coastal Range, alt. 0.2300 m., Aug. 28–Sept. 4, 1918, Pittier 8108 (US, isotype, MBG, photograph and analytical drawings); ANZOATEGUI: on humid rocks, Ocumare Valley, Aragua, Oct. 12, 1927, Pittier 12556 (US).

62. *Mandevilla Muelleri* Woodson, nom. nov.

Dipladenia scabra Muell.-Arg. in Mart. Fl. Bras. 6¹: 128.
1860, not acc. to Miers, loc. cit. 155. 1878.

Suffruticose lianas (occasionally suberect?); stems terete or slightly compressed, relatively stout, minutely hirtellous when young, eventually glabrate; leaves opposite, shortly petiolate, broadly oblong to obovate-oblong, apex abruptly acuminate, base rounded and obscurely cordate, 5–9 cm. long, 2.5–4.0 cm. broad, coriaceous, either surface minutely hirtellous when young, becoming seaceous; petiole 0.25–0.5 cm. long; nodal appendages obsolete or extremely inconspicuous, at least above; racemes simple, lateral, alternate, somewhat longer than the subtending

leaves, bearing 6–8 white or cream-colored (or pinkish?) flowers; pedicels 1 cm. long; bracts ovate-lanceolate, 0.3–0.4 cm. long, scarious; calyx-lobes lanceolate, long-acuminate, 0.8–1.0 cm. long, scarious, glabrous, the squamellae in alternate groups of 4–6; corolla infundibuliform, glabrous without, the proper-tube straight, 1.5 cm. long, about 0.15 cm. in diameter at the base, the throat tubular-conical, 1.5–1.75 cm. long, about 0.75 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2.0–2.25 cm. long, widely spreading; anthers auriculate, 0.75 cm. long; ovary ovoid, about 0.1 cm. long, glabrous; stigma 0.2 cm. long, obscurely apiculate; nectaries 2, ovoid-reniform, about half as long as the ovary; follicles unknown.

BRAZIL: DATA INCOMPLETE: *Sellow 34* (B, TYPE, MBG, photograph and analytical drawings).

This change in name is necessitated by the preexistence of *M. scabra* (R. & S.) K. Sch.

63. *Mandevilla lucida* Woodson, spec. nov.

Suffrutices volubiles; ramulis teretibus vel paulo compressis crassiusculis, glabris; foliis oppositis petiolatis late oblongo-ellipticis abrupte acuminatis basi rotundatis vel late obscureque cordatis 6–9 cm. longis 3.5–5.0 cm. latis coriaceis glabris supra nitidis nervo medio basi pauciglanduligero; petiolo 1.0–1.5 cm. longo; nodiis superioribus ut videntur exappendiculatis; inflorescentiis lateralibus alternatis racemosis simplicibus quam foliis paulo brevioribus floribus albidas 3–8 gerentibus; pedicellis 0.8–1.0 cm. longis; bracteis ovatis scariaceis minimis; calycis laciniis oblongis acuminatis 0.6–0.8 cm. longis scariaceis vel paulo foliaceis glabris intus basi in marginibus 4–6-glanduligeris; corollae infundibuliformis extus glabrae tubo proprio recto 0.8–1.0 cm. longo basi ca. 0.15 cm. diametro metiente faucibus tubulo-conicis 0.8–1.0 cm. longis ostio ca. 0.4 cm. diametro metiente lobis oblique obovatis acuminatis 1.3–1.5 cm. longis patulis; antheris auriculatis 0.6 cm. longis; ovario oblongoideo ca. 0.2 cm. longo glabro; stigmate 0.2 cm. longo obscure apiculato; nectariis 2 ovoideo-reniformibus ovario ca dimidio brevioribus; folliculis crassiusculis continuis, divaricatis, 6–7 cm. longis glabris; seminibus 0.8 cm. longis como aurantiaco ca. 2 cm. longo.

Glabrous, suffruticose lianas; stems terete or slightly compressed, relatively stout; leaves opposite, petiolate, broadly oblong-elliptic, apex abruptly acuminate, base rounded to broadly and rather obscurely cordate, 6–9 cm. long, 3.5–5.0 cm. broad, coriaceous, upper surface strikingly nitidulous, glandular at the base of the midrib; petiole 1.0–1.5 cm. long; nodal appendages obsolete or extremely inconspicuous above; racemes simple, lateral, alternate, somewhat shorter than the subtending leaves, bearing 3–8 showy, white flowers; pedicels 0.8–1.0 cm. long; bracts minutely ovate, scarious; calyx-lobes oblong, acuminate, 0.6–0.8 cm. long, subfoliaceous, the squamellae in alternate groups of 4–6; corolla infundibuliform, glabrous without, the proper-tube straight, 0.8–1.0 cm. long, about 0.15 cm. in diameter at the base, the throat tubular conical, 0.8–1.0 cm. long, about 0.4 cm. in diameter at the orifice, the lobes obliquely obovate, acuminate, 1.3–1.5 cm. long, widely spreading; anthers auriculate, 0.6 cm. long; ovary oblongoid, about 0.2 cm. long, glabrous; stigma 0.2 cm. long, obscurely apiculate; nectaries 2, ovoid-reniform, compressed, about half as long as the ovary; follicles relatively short and stout, essentially continuous, somewhat divaricate, 6–7 cm. long, glabrous; seeds 0.8 cm. long, the tawny coma 2 cm. long.

BRAZIL: RIO DE JANEIRO: environs, Febr., 1882, Glaziou 12955 (C, K, TYPE, MBG, photograph and analytical drawings).

Because of its relatively small corolla, subfoliaceous calyx-lobes, and thickly coriaceous, lustrous foliage, this species is very conspicuous among its closely neighboring congeners. Additional collections are greatly to be desired.

64. *Mandevilla Sellowii* (Muell.-Arg.) Woodson, comb. nov.

Dipladenia Sellowii Muell.-Arg. in Mart. Fl. Bras. 6¹: 128.
1860.

Micradenia Sellowii (Muell.-Arg.) Miers, Apoc. So. Am. 161.
1878.

Glabrous, suffruticose lianas, rarely suberect; leaves opposite, petiolate, rather narrowly elliptic, apex acuminate to subcaudate-acuminate, base broadly acute, 5–8 cm. long, 2–3 cm. broad, coriaceous, dark green, sparsely glandular at the base of

the midrib above; petiole 1.25–1.5 cm. long; nodal appendages obsolete or extremely inconspicuous, at least above; racemes simple, lateral, alternate, somewhat longer than the subtending leaves, bearing 3–5 showy, rose-colored flowers; pedicels 1 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-lanceolate, acuminate, 0.7–0.9 cm. long, scarious, the squamellae in alternate groups of 4–6; corolla infundibuliform, glabrous without, the proper-tube straight, 2.5–3.0 cm. long, about 0.15 cm. in diameter at the base, the throat rather broadly conical, 2.5–2.75 cm. long, about 2 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2.5–3.0 cm. long, widely spreading; anthers auriculate, 1 cm. long; ovary oblongoid, about 0.25 cm. long, glabrous; stigma 0.3 cm. long, obscurely apiculate; nectaries 2, ovoid-reniform, about half as long as the ovary; mature follicles unknown.

BRAZIL: MINAS GERAES: exact locality and date lacking, *Sellow s. n.* (Bx, TYPE, Camb., MBG, photograph and analytical drawings); RIO DE JANEIRO: exact locality and date lacking, *Glaziou* 8803 (C, K); DATA INCOMPLETE: *Glaziou* 15215 (C).

65. *Mandevilla Sanderi* (Hemsl.) Woodson, comb. nov.

Dipladenia Sanderi Hemsl. Gard. Chron. III. 20: 652. 1896.

Glabrous, suffruticose lianas; stems terete, relatively stout; leaves opposite, petiolate, broadly oblong-elliptic, apex shortly acuminate, base rounded to very obscurely cordate, 4.5–6.0 cm. long, 2.5–3.0 cm. broad, coriaceous, pale and nitidulous, sparsely glandular above; petiole 0.75–1.0 cm. long; nodal appendages obsolete or extremely inconspicuous, at least above; racemes simple, lateral, alternate, about as long as the subtending leaves, bearing 3–5 showy, rose-pink flowers; pedicels 1.25 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-lanceolate, acuminate, 0.75 cm. long, scarious, the squamellae in alternate groups of 4–6; corolla infundibuliform, glabrous without, the proper-tube straight, 2.25–2.5 cm. long, about 0.2 cm. in diameter at the base, the throat broadly conical, 2 cm. long, about 2 cm. in diameter at the orifice, the lobes obliquely obovate, scarcely acuminate, 3.0–3.25 cm. long, widely spreading; anthers unknown; ovary oblongoid, gradually produced into the style, 0.25 cm. long; stigma unknown; nectaries 2, ovoid-reniform, about half as long as the ovary; follicles unknown.

M. Sanderi is known at present only from a single specimen of a Brazilian plant imported by Sander & Co. of St. Albans, England. The type specimen, which has been examined in the course of this study, is deposited in the herbarium of the Royal Botanic Gardens, Kew, and a photograph has been incorporated in the herbarium of the Missouri Botanical Garden. Although closely related to *M. Sellowii*, the very distinct foliage appears to justify the retention of *M. Sanderi* as a species.

66. *Mandevilla immaculata* Woodson, spec. nov.

Suffrutices volubiles; ramulis teretibus gracilibus glabris; foliis oppositis petiolatis late ellipticis apice abrupte acuminatis vel subcaudato-acuminatis basi obtusis 4–6 cm. longis 2–3 cm. latis membranaceis omnino glabris supra eglandulosis; petiolo 1.0–1.5 cm. longo; nodiis superioribus exappendiculatis; inflorescentiis lateralibus alternatis racemosis simplicibus foliis aequantibus vel paulo superantibus floras speciosas roseas 2–3 gerentibus; pedicellis 1.0–1.25 cm. longis; bracteis ovatis scariaceis minimis; calycis laciniis ovato-lanceolatis acuminatis 0.7–0.8 cm. longis scariaceis glabris intus basi in marginibus 2–4-glanduligeris; corollae infundibuliformis extus glabrae tubo proprio recto 1.8–2.0 cm. longo basi ca. 0.2 cm. diametro metiente faucibus campanulatis 1.5–2.0 cm. longis ostio ca. 1.25–1.5 cm. diametro metiente lobis oblique obovatis acuminatis 2.5–3.0 cm. longis patulis; antheris auriculatis 1 cm. longis; ovario oblongoideo ca. 0.3 cm. longo glabro; stigmate 0.2 cm. longo obscure apiculato; nectariis 2 anguste oblongoideis ovario ca. dimidio brevioribus; folliculis ignotis.

Glabrous, suffruticose or suffrutescent lianas; stems terete, relatively slender; leaves opposite, petiolate, broadly elliptic, apex abruptly acuminate to subcaudate-acuminate, base obtuse, 4–6 cm. long, 2–3 cm. broad, firmly membranaceous, eglandular above; petiole 1.0–1.5 cm. long; nodal appendages obsolete or extremely inconspicuous, at least above; racemes simple, lateral, alternate, equaling or somewhat surpassing the subtending leaves, bearing 2–3 showy, rose-colored flowers; pedicels 1.0–1.25 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-lanceolate, acuminate, 0.7–0.8 cm. long, scarious, the squamellae in

alternate groups of 2-4; corolla infundibuliform, glabrous without, the proper-tube straight, 1.8-2.0 cm. long, about 0.2 cm. in diameter at the base, the throat campanulate, 1.5-2.0 cm. long, about 1.25-1.5 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2.5-3.0 cm. long, widely spreading; anthers auriculate, 1 cm. long; ovary oblongoid, about 0.3 cm. long; stigma 0.2 cm. long, rather obscurely apiculate; nectaries 2, compressed-oblongoid, about half as long as the ovary; follicles unknown.

BRAZIL: SÃO PAULO: exact locality lacking, 1861-62, Weir 462 (K); PARANA: Banhado, in silva primaeva, Dec. 30, 1908, Dusen 7409 (G, MBG, TYPE); Banhado, in graminosis subhumidis, Dec. 13, 1911, Dusen s. n. (US).

This species is instantly distinguishable from *M. Sellowii*, with which it has been confused, by its broadly campanulate corolla-throat, and broader, membranaceous, eglandular foliage.

67. ***Mandevilla urophylla* (Hook. f.) Woodson, comb. nov.**

Dipladenia urophylla Hook. f. Bot. Mag. III. 4: pl. 4414. 1848; Muell.-Arg. in Mart. Fl. Bras. 6: 131. 1860.

Micradenia urophylla (Hook. f.) Miers, Apoc. So. Am. 161. 1878.

Glabrous, suffruticose or suffrutescent lianas; stems terete, relatively slender; leaves opposite, petiolate, rather broadly elliptic to ovate or obovate-elliptic, apex abruptly caudate-acuminate, base obtuse to rounded, 6-10 cm. long, 2.5-4.5 cm. broad, subcoriaceous, somewhat nitidulous and sparsely glandular at the base of the midrib above; petiole 1.5-2.25 cm. long; nodal appendages obsolete or extremely inconspicuous; racemes simple, lateral, alternate, somewhat shorter than the subtending leaves, bearing 4-7 showy, cream-colored, rose-flushed flowers; pedicels 1.0-1.25 cm. long; bracts minutely ovate-lanceolate, scarious; calyx-lobes ovate-lanceolate, acute, 0.4-0.5 cm. long, the squamellae in alternate groups of 4-6; corolla infundibuliform, glabrous without, the proper tube straight, 0.6-0.8 cm. long, about 0.25 cm. in diameter at the base, the throat rather narrowly campanulate, 2.0-2.25 cm. long, about 1.25 cm. in diameter at the orifice, the lobes obovate-reniform, obscurely acuminate, 1.25-1.5 cm. long, pink, widely spreading; anthers auriculate, 0.6

cm. long; ovary oblongoid, 0.3 cm. long, glabrous; stigma 0.2 cm. long, shortly apiculate; nectaries 2, compressed-obovoid, about one-third as long as the ovary; follicles relatively slender, continuous, 10–15 cm. long, glabrous, seeds 0.5 cm. long, the pale-tawny coma 2 cm. long.

BRAZIL: RIO DE JANEIRO: "environs," April, 1883, *Glaziou* 14061 (C, K); near Rio de Janeiro, Nov., 1869, *Glaziou* 11190 (C, K); "Rio," date lacking, *Glaziou* 19627 (C, K); Organ Mts. between Soberbo and Guapy, alt. 100–900 m., Dec. 18, 1928, L. B. Smith 1529 (G); PARANA: in vicinia Morretes, ad ripam fluminis Rio Marumby, alt. 40 m., Jan. 23, 1914, *Dusen* 14384 (G, MBG, US); Serra do Mar, Volta Grande, in silva primaeva, alt. 400 m., July 31, 1911, *Dusen* 11988 (G, MBG); Cadeado, in rupibus fere perpendicularibus nec non in declivibus graminosis, Dec. 13, 1909, *Dusen* 8681 (AA, MBG); Volta Grande, ad marginem silvae primaevae, Nov. 19, 1911, *Dusen* 13430 (US); exact locality lacking, Febr. 10, 1904, *Dusen* 3564 (US).

68. *Mandevilla venulosa* (Muell.-Arg.) Woodson, comb. nov.
Dipladenia venulosa Muell.-Arg. in Mart. Fl. Bras. 6¹: 126. 1860; Miers, Apoc. So. Am. 156. 1878.

Essentially glabrous, erect or suberect, suffrutescent under-shrubs, rarely twining; stems terete or slightly compressed, relatively stout; leaves opposite, sessile or subsessile, broadly ovate-elliptic, apex obtuse to very abruptly and shortly acuminate, base broadly cordate and somewhat amplexicaul, 7–12 cm. long, 4.0–7.5 cm. broad, coriaceous, nitidulous and sparsely glandular at the base of the midrib above; nodal appendages obsolete or extremely inconspicuous; racemes simple, lateral or subterminal, alternate, about as long as the subtending leaves, bearing 3–5 showy, cream-colored or pinkish flowers; pedicels 1.0–1.25 cm. long; bracts ovate-lanceolate, 0.3–0.6 cm. long, scarios; calyx-lobes lanceolate, acuminate, 1.0–1.25 cm. long, scarios, the squamellae in irregular groups or indefinitely distributed; corolla infundibuliform, glabrous without, the proper-tube 1.0–1.25 cm. long, about 0.25 cm. in diameter at the base, the throat rather narrowly campanulate, 2.25 cm. long, about 1.25 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 3.5–4.0 cm. long, widely spreading; anthers auriculate, 0.9 cm. long, sparsely pilosulose dorsally; ovary oblongoid, about 0.3 cm. long, glabrous; stigma 0.3 cm. long, conspicuously apiculate; nectaries 2, reniform, about 0.5

cm. long; follicles relatively stout, essentially continuous, 12–15 cm. long, glabrous; seeds 0.5 cm. long, the brilliant tawny coma 1.5 cm. long.

BRAZIL: MINAS GERAES: Caldas, Oct., 1854, *Lindberg 194a* (Bx, TYPE, MBG, photograph and analytical drawings); exact locality lacking, Dec. 10, 1873, *Mosen 947* (C); exact locality lacking, Oct. 16, 1861, *Regnell 875* (Bx, M, US); "dans les savanes," date lacking, *Claussen s. n.* (V).

69. *Mandevilla atroviolacea* (Stadelm.) Woodson, comb. nov.

Echites atroviolacea Stadelm. Flora 24¹: Beibl. 75. 1841.

Echites atropurpurea Lindl. in Paxt. Mag. Bot. 9: 199. 1842.

Dipladenia atroviolacea (Stadelm.) A. DC. in DC. Prodr. 8:

484. 1844; Muell.-Arg. in Mart. Fl. Bras. 6¹: 127. 1860.

Dipladenia atropurpurea (Lindl.) A. DC. loc. cit. 486. 1844.

Dipladenia atroviolacea (Stadelm.) A. DC. α . *latifolia* Muell.-Arg. loc. cit. 1860.

Dipladenia atroviolacea (Stadelm.) A. DC. α . *latifolia* Muell.-

Arg. 1. *scandens* Muell.-Arg. loc. cit. 1860.

Dipladenia atroviolacea (Stadelm.) A. DC. α . *latifolia* Muell.-Arg. 2. *suberecta* Muell.-Arg. loc. cit. 1860.

Dipladenia atroviolacea (Stadelm.) A. DC. β . *cuneata* Muell.-Arg. loc. cit. 1860.

Dipladenia atroviolacea (Stadelm.) A. DC. γ ? *cordata* Muell.-Arg. loc. cit. 1860.

Micradenia atroviolacea (Stadelm.) Miers, Apoc. So. Am. 159. 1878.

Glabrous, suffrutescent lianas, occasionally suberect; stems terete, relatively slender; leaves opposite, petiolate, broadly elliptic to obovate-elliptic, apex caudate-acuminate, base obtuse to rounded, 2.0–4.5 cm. long, 1.75–2.5 cm. broad, firmly membranaceous to subcoriaceous, eglandular at the base of the midrib above; petiole 0.75–1.25 cm. long; nodal appendages obsolete or extremely inconspicuous; racemes simple, lateral to subterminal, alternate, equaling or somewhat surpassing the subtending leaves, bearing 2–5 showy, dark reddish purple flowers; pedicels 1.0–1.25 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-to oblong-lanceolate, acuminate, 0.4–0.6 cm. long, scarious, the squamellae nearly quadrate, geminate; corolla infundibuliform,

glabrous without, the proper-tube straight, 1.25–2.0 cm. long, about 0.3 cm. in diameter at the base, the throat rather narrowly campanulate, 2–3 cm. long, about 1.25–1.5 cm. in diameter at the orifice, the lobes obliquely obovate to obovate-reniform, obscurely acuminate, 1.5–1.75 cm. long, nearly erect or slightly spreading; anthers auriculate, 0.8 cm. long; ovary oblongoid, about 0.2 cm. long, glabrous; stigma 0.25 cm. long, rather obscurely apiculate; nectaries 2, compressed-ovoid, about half as long as the ovary; follicles relatively slender, continuous, 15–20 cm. long; seeds 0.5 cm. long, the pale tawny coma 2 cm. long.

BRAZIL: MINAS GERAES: in monte Serra da Piedade, Febr. 2, 1866, Engle s. n. (C); exact locality lacking, 1862, Netto (Bx, MP); RIO DE JANEIRO: ad urbem in rupibus cacuminis Poci do Papagaio montium Tijuea, Nov. 29, 1928, Ducke 21809 (US); haut du Pico do Papagaio, Oct. 12, 1867, Glaziou 2099 (Bx); on the summit of the Pedra Bonita, date lacking, Gardner 249 (Camb.); exact locality lacking, 1867, Glaziou 635 (Bx); exact locality and date lacking, Glaziou s. n. (Bx); SÃO PAULO: in campis herbidis uidis ad Mogi das Cruzes et alibi in sylvaticis, Dec., year lacking, Martius 506 (M, TYPE, MBG, photograph); PARANA: Jaguariahyva, ad marg. silvae primaevae, alt. 740 m., March 25, 1916, Dusen 18012 (G, MBG); exact locality lacking, Dec. 22, 1903, Dusen s. n. (US); DATA INCOMPLETE: Sellow 1656 (Bx); Sellow s. n. (Bx); Glaziou 3054 (C); Glaziou 2091 (C).

70. *Mandevilla pendula* (Ule) Woodson, comb. nov.

Dipladenia pendula Ule, Ber. Deut. Bot. Ges. 14: 234. 1896.

Glabrous, suffrutescent lianas, occasionally suberect; stems terete, relatively slender; leaves opposite, petiolate, narrowly elliptic to obovate-elliptic, apex shortly subcaudate-acuminate, base obtuse, 3.5–7.5 cm. long, 1.5–3.25 cm. broad, firmly membranaceous to subcoriaceous, somewhat nitidulous, eglandular at the base of the midrib above; petiole 1–2 cm. long; nodal appendages obsolete or extremely inconspicuous; racemes simple, lateral to subterminal, alternate, equaling or somewhat surpassing the length of the subtending leaves, bearing 3–7 showy, cream and reddish purple flowers; pedicels 2.0–2.25 cm. long; bracts minutely ovate, scarious; calyx-lobes lanceolate, acuminate, 0.75–1.0 cm. long, scarious, the squamellae depressed-quadratae, geminate; corolla infundibuliform, glabrous without, the proper-tube straight, 1.25 cm. long, about 0.2 cm. in diameter at the base, reddish purple, the throat tubular-campanulate, 2–3 cm. long, about 1.0–1.25 cm. in diameter at the orifice, reddish purple

at the base, the lobes obliquely oblong-ovate to narrowly oblong-elliptic, acute, 1.25–2.0 cm. long, cream-colored, erect or essentially so; anthers auriculate, 0.7 cm. long; ovary ovoid-oblongoid, about 0.2 cm. long, glabrous; stigma 0.15 cm. long, obscurely apiculate; nectaries 2, compressed-ovoid, about half as long as the ovary; follicles unknown.

BRAZIL: MINAS GERAES: Retiro, Serra dos Orgãos, Oct., 1916, Luetzelburg 6953 (M); RIO DE JANEIRO: in regione Itatiaya, alt. 1400–2000 m., Sept., 1901, Wettstein & Shiffner s. n. (C, V); "environ," April, 1882, Glaziou 14062 (C, K); "Rio," date lacking, Glaziou 17135 (C, K); exact locality and date lacking, Glaziou 6638 (K); SÃO PAULO: Alto do Serra, Nov. 3, 1917, Hoehne 834 (M).

71. *Mandevilla sancta* (Stadelm.) Woodson, comb. nov.

Echites sancta Stadelm. Flora 24¹: Beibl. 59. 1841.

Dipladenia sancta (Stadelm.) A. DC. in DC. Prodr. 8: 484. 1844; Muell.-Arg. in Mart. Fl. Bras. 6¹: 126. 1860; Miers, Apoc. So. Am. 154. 1878.

Glabrous, suffruticose undershrubs; stems terete, relatively stout; leaves opposite, sessile to very shortly petiolate, broadly ovate-oblong to suborbicular, apex abruptly and shortly acute to acuminate, rarely obtuse or retuse, base rounded to obscurely cordate, occasionally somewhat amplexicaul, 3–5 cm. long, 2.25–5 cm. broad, coriaceous, sparsely glandular at the base of the midrib above; nodal appendages obsolete or very inconspicuous; racemes subterminal, simple, usually somewhat shorter than the subtending leaves, bearing 8–12 showy, rose-red flowers; pedicels 0.75–1.0 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate to ovate-lanceolate, acuminate, 0.5–0.75 cm. long, scarious, the squamellae in alternate groups of 2–6; corolla infundibuliform, glabrous without, the proper-tube 1.5–2.0 cm. long, about 0.2 cm. in diameter at the base, the throat narrowly campanulate, 2.0–2.25 cm. long, about 1.5 cm. in diameter at the orifice, the lobes obliquely obovate, very shortly acuminate, 2.0–2.25 cm. long, widely spreading; anthers auriculate, 0.8–1.0 cm. long; ovary ovoid-oblongoid, about 0.2 cm. long, glabrous; stigma 0.2–0.3 cm. long, rather obscurely apiculate; nectaries 2, compressed-ovoid, about half as long as the ovary; follicles relatively slender, continuous, 10–12 cm. long, glabrous; seeds 0.6 cm. long, the pale tawny coma 1.75 cm. long.

BRAZIL: BAHIA: Monte Santo, Apr., year lacking, *Martius* 307 (M, TYPE, MBG, photograph and analytical drawings); auf Felsen bei Maracas, Sept., 1906, *Ule* 7020 (K, MBG, photograph and analytical drawings).

The two specimens cited do not agree in all particulars. That of Martius has somewhat larger, more nearly orbicular leaves which are cordate and practically sessile, while that of Ule is characterized by leaves which are rounded, but scarcely cordate at the base and are borne upon short (0.1–0.2 cm.) petioles. Future evidence may prove them to be distinct.

72. *Mandevilla illustris* (Vell.) Woodson, comb. nov.

Erect, suffrutescent herbs from a napiform, tuberous root; stems terete or slightly compressed, relatively stout; leaves opposite or rarely ternate, sessile or subsessile, broadly oblong-elliptic to ovate or obovate, occasionally suborbicular, apex abruptly and shortly acute to acuminate or occasionally somewhat obtuse or retuse, base obtuse or rounded, frequently rather obscurely cordate, 4–10 cm. long, 3.0–8.5 cm. broad, firmly membranaceous to chartaceous; nodal appendages obsolete or extremely inconspicuous; racemes terminal, occasionally sub-terminal, simple, equaling or somewhat surpassing the subtending leaves, bearing 2–9 showy, deep pink or rosy-red flowers; pedicels 1.0–1.5 cm. long; bracts lanceolate, acuminate, 0.3–0.5 cm. long, scarious; calyx-lobes lanceolate to ovate-lanceolate, acuminate, 0.75–1.25 cm. long, scarious, the squamellae in alternate groups of 2; corolla infundibuliform, the proper-tube straight, 1.25–1.75 cm. long, about 0.2 cm. in diameter at the base, the throat narrowly conical, 1.5–2.5 cm. long, about 0.75–1.0 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2.5–3.0 cm. long, widely spreading; anthers auriculate, 0.7–0.8 cm. long; ovary ovoid, about 0.2 cm. long, glabrous; stigma 0.2 cm. long, shortly apiculate; nectaries 2, compressed-ovoid, about half as long as the ovary; follicles relatively long and stout, continuous, 20–30 cm. long, glabrous; seeds 0.75 cm. long, the brilliant tawny coma about 2 cm. long.

Var. *typica*.

Echites illustris Vell. Fl. Flum. 114. 1830; Icon. 3: pl. 49.
1827; Stadelm. Flora 24¹: Beibl. 69. 1841.

- Echites venenosa* Stadelm. loc. cit. 66. 1841; A. DC. in DC. Prodr. 8: 470. 1844.
- Dipladenia illustris* (Vell.) A. DC. loc. cit. 483. 1844; Miers, Apoc. So. Am. 153. 1878.
- Dipladenia Gardneriana* A. DC. loc. cit. 1844; Miers, loc. cit. 155. 1878.
- Dipladenia Gardneriana* A. DC. β . *grandiflora* A. DC. loc. cit. 1844.
- Echites Rosa-campestris* Endl. in Harting. Parad. Vindob. 1: pl. 51. 1844-47.
- Dipladenia Rosa-campestris* (Endl.) Lem. Fl. Serres & Jard. I. 3^o: 256. pl. 4. 1847; Miers, loc. cit. 156. 1878.
- Dipladenia illustris* (Vell.) Muell.-Arg. in Mart. Fl. Bras. 6^o: 125. 1860, sphalm.
- Dipladenia illustris* (Vell.) Muell.-Arg. α . *tomentosa* Muell.-Arg. loc. cit. 1860.
- Dipladenia illustris* (Vell.) Muell.-Arg. α . *tomentosa* Muell.-Arg. α . *rotundifolia* Muell.-Arg. loc. cit. 1860.
- Dipladenia illustris* (Vell.) Muell.-Arg. α . *tomentosa* Muell.-Arg. α . *rotundifolia* Muell.-Arg. 1. *hirsuta* Muell.-Arg. loc. cit. 1860.
- Dipladenia illustris* (A. DC.) Muell.-Arg. α . *tomentosa* Muell.-Arg. α . *rotundifolia* Muell.-Arg. 2. *pubescens* Muell.-Arg. loc. cit. 1860.
- Dipladenia illustris* (A. DC.) Muell.-Arg. α . *tomentosa* Muell.-Arg. b . *elliptica* Muell.-Arg. loc. cit. 1860.
- Dipladenia illustris* (A. DC.) Muell.-Arg. α . *tomentosa* Muell.-Arg. b . *elliptica* Muell.-Arg. 1. *hirsuta* Muell.-Arg. loc. cit. 1860.
- Dipladenia illustris* (A. DC.) Muell.-Arg. α . *tomentosa* Muell.-Arg. b . *elliptica* Muell.-Arg. 2. *pubescens* Muell.-Arg. loc. cit. 1860.
- Dipladenia illustris* (A. DC.) Muell.-Arg. α . *tomentosa* Muell.-Arg. c . *oblongifolia* Muell.-Arg. loc. cit. 1860.
- Dipladenia illustris* (Vell.) A. DC. f. *pilosa* Hoehne, Comm. Linh. Telegr. Estrat. Matto Grosso, Annexo 5, Bot. 6: 85. 1915.

Stems, foliage, and calyx-lobes tomentose to pilose; all other characters similar to the species.

BRAZIL: MINAS GERAES: Caldas, in campis, Oct. 22, 1854, *Lindberg* 194 (Bx); in campis prope Ypanema, March, year lacking, *Martius* s. n. (M); congonhas do Campo, date lacking, *Martius* 293 (Bx, MBG, photograph); Caldas, 1859-60, *Regnell* 280 (Bx, C, M, S, US); Barbacena, date lacking, *Pohl* s. n. (Bx, MBG, photograph); Lagoa Santa, Oct. 28, 1863, *Warming* s. n. (C); exact locality lacking, 1845, *Widgren* 370 (Bx, G, US); Aug.-April, 1840, *Claussen* 99, 100 (Bx); *Claussen* 331 (C, MP); *Glaziou* 17134 (C); BAHIA: Igreja Velha, date lacking, *Blanchet* 3382 (C); Sincora et Lages, Nov., year lacking, *Martius* s. n. (M); GOYAZ: Ponta Alta, Sept. 27, 1894, *Glaziou* 21724 (Bx, C, MP, US); exact locality lacking, *Gardner* 3311 (NY); PARANA: Jaguariahyva, in campo cerrado, alt. 760 m., Nov. 27, 1914, *Dusen* 15913 (MBG); same locality, Oct. 31, 1910, *Dusen* 10693 (G, MBG, US); DATA INCOMPLETE: *Glaziou* 15217 (C, Bx); *Glaziou* s. n. (Bx); *Burchell* 63961 (Bx); *Sellow* 1658 (Bx); *Pohl* s. n. (Bx, M); *Riedel* s. n. (BB, Bx, G, M); *Warming* s. n. (C); *Bang* s. n. (Bx).

Var. *glabra* (Muell.-Arg.) Woodson, comb. nov.

Echites alexicaca Stadelm. Flora 24^t: Beibl. 68. 1841.

Dipladenia alexicaca (Stadelm.) A. DC. in DC. Prodr. 8: 484. 1844; Miers, Apoc. So. Am. 156. 1878.

Dipladenia androsaemifolia A. DC. loc. cit. 1844; Miers, loc. cit. 1878.

Dipladenia nobilis Morr. Ann. Soc. Gand 3: 331. pl. 152. 1847; Muell.-Arg. in Mart. Fl. Bras. 6^t: 130. 1860.

Dipladenia illustris (Vell.) Muell.-Arg. *β. glabra* Muell.-Arg. loc. cit. 125. pl. 38. 1860.

Chariomma nobilis (Morr.) Miers, loc. cit. 113. 1878.

Dipladenia illustris (Vell.) A. DC. f. *glabra* (Muell.-Arg.) Hoehne, Comm. Linh. Telegr. Estrat. Matto Grosso, Annexo 5, Bot. 6: 85. 1915.

Plants glabrous throughout, or essentially so; in all other characters similar to the species.

BRAZIL: MARANHÃO: deep sandy slope, 25 leagues s. w. of Barro do Corda, Oct. 31, 1924, *Shaw* s. n. (US); BAHIA: in campis altis ad Rio de Contas, date lacking, *Martius* 299 (M, MBG, photograph); Igreja Velha, date lacking, *Blanchet* 3382 in part (Bx, C, M, MBG, NY); MINAS GERAES: Lagoa Santa, date lacking, *Engle* s. n. (C); exact locality lacking, date lacking, *Martius* s. n. (M).

It appears highly impractical to subdivide this species into many varieties upon the basis of such variable characters as leaf outline and size, nature and amount of pubescence, number of flowers, etc.

73. *Mandevilla cuspidata* (Rusby) Woodson, comb. nov.

Dipladenia cuspidata Rusby, Bull. N. Y. Bot. Gard. 4: 410. 1907.

Dipladenia mollis Rusby, loc. cit. 8: 114. 1912.

Dipladenia Buchtienii Rusby, Descr. So. Am. Pl. 87. 1920.

Dipladenia piladenia Rusby, loc. cit. 1920.

Dipladenia tetradenia Rusby, loc. cit. 88. 1920.

Odontadenia cuspidata Rusby, loc. cit. 89. 1920.

Dipladenia rotundifolia Rusby, Mem. N. Y. Bot. Gard. 7: 326. 1927.

Erect, suffrutescent herbs; stems terete, relatively stout, densely puberulent-pilosulose to glabrate or glabrous; leaves opposite, sessile to subsessile, suborbicular to ovate or broadly oblong-elliptic, apex very abruptly and shortly acute to acuminate, occasionally obtuse or somewhat retuse, base rounded and usually rather broadly and obscurely cordate, 5-10 cm. long, 2-7 cm. broad, firmly membranaceous, finely and densely puberulent-pilose to glabrate, very rarely essentially glabrous, sparsely glandular at the base of the midrib above; nodal appendages obsolete or extremely inconspicuous; racemes terminal, simple, usually greatly surpassing the subtending leaves, bearing 2-8 showy, cream-colored or pink-flushed flowers; pedicels 1-2 cm. long; bracts lanceolate to ovate-lanceolate, acuminate, 0.3-0.5 cm. long, scarious; calyx-lobes lanceolate to ovate-lanceolate, acuminate, 0.5-1.0 cm. long, scarious, the squamellae in alternate groups of 2-4; corolla infundibuliform, the proper-tube straight, 1.25-2.0 cm. long, about 0.25 cm. in diameter at the base, the throat narrowly conical to subtubular, 2.0-3.25 cm. long, about 0.75-1.5 cm. in diameter at the orifice, the lobes obliquely obovate, acuminate, 2.5-3.25 cm. long, widely spreading; anthers auriculate, 0.7-0.8 cm. long; ovary ovoid-oblongoid, 0.1-0.2 cm. long, glabrous; stigma 0.2 cm. long, obscurely apiculate; nectaries 2-5, more or less dissimilar in size and shape, usually lobed or emarginate when fewer than 5, about half as long as the ovary; follicles unknown.

PERU: CUZCO: Valle de Santa Ana, Purnachaca, alt. 1400 m., Oct., 1931, Herrera 3232 (US).

BOLIVIA: LA PAZ: Polo-Polo bei Coroico, alt. 1100 m., Oct.-Nov., 1912, Buchtien 3903 (NY, US, MBG, photograph); Milluhuaya, alt. 1800 m., Dec., 1917, Buchtien

4032 (US); Ixiamas, alt. 800 ft., Dec. 16, 1921, *Cardenas* 1144 (NY, MBG, photograph); Reis, alt. 1500 ft., June, 1886, *Rusby* 2694 (NY, MBG, photograph); "Yungas," 1890, *Bang* 249 (BB, G, K, M, MBG, NY, US).

This species is almost bewildering in the great variability of virtually all characters, including several of the most important systematically. The variation in number and constitution of the gynoecial nectaries of *M. cuspidata* provides one of the most cogent arguments against the validity of the genus *Dipladenia*, as they appear to be constant not even for occasional individual plants. The size and shape of the corolla is also very inconstant.

M. cuspidata is extremely closely related to *M. illustris*, with which it may scarcely be separated in several instances. Beside the key characters upon which they are separated, and of which that of geography must be admittedly one of the most trustworthy superficially, the dimensions and constitution of the corolla appear significant. The proper-tube of *M. cuspidata* as a rule is somewhat shorter in proportion to the length of the throat than in *M. illustris*. Although such a character is difficult to use as a criterion in a key, due to occasional intergradation, its validity may be affirmatively tested upon a number of specimens.

74. *Mandevilla velutina* (Mart.) Woodson, comb. nov.

Erect, suffrutescent herbs, from a napiform, tuberous root; stems terete, relatively stout; leaves opposite, shortly petiolate to subsessile, ovate or obovate to ovate- or obovate-oblong, occasionally narrowly oblong to oblong-oblanceolate, apex abruptly acuminate to obtuse or occasionally somewhat retuse, base rather abruptly rounded and usually obscurely cordate, occasionally obtuse to rounded, 3.5–12.0 cm. long, 1.5–6.0 cm. broad, firmly membranaceous, sparsely glandular at the base of the midrib above, occasionally eglandular; petiole 0.1–0.3 cm. long or essentially obsolete; nodal appendages obsolete or extremely inconspicuous; racemes terminal, simple, usually about twice as long as the subtending leaves, bearing 2–10 showy, pink flowers; pedicels 1.0–1.5 cm. long; bracts lanceolate to ovate-lanceolate, acuminate, 0.2–0.5 cm. long, scarious; calyx-lobes lanceolate to ovate-lanceolate, acuminate, 0.6–1.25 cm. long, scarious, the squamellae dentiform, in alternate groups of 4–6; corolla infundibuliform, the proper-tube straight, 1.0–1.25 cm. long, about 0.25

cm. in diameter at the base, the throat broadly tubular, slightly narrowing toward the orifice, 2.75–5.0 cm. long, about 0.75–1.25 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2.0–3.25 cm. long, very slightly spreading; anthers auriculate, 0.7–0.9 cm. long; ovary ovoid-oblongoid, 0.15–0.2 cm. long, glabrous; stigma 0.2 cm. long, rather obscurely apiculate; nectaries 2, compressed-obovoid, truncate or slightly lobed or emarginate, about half as long as the ovary; follicles relatively long and slender, continuous, 20–30 cm. long; seeds not examined.

Var. *typica*.

Echites velutina Mart. ex Stadelm. Flora 24¹: Beibl. 72. 1841.

Dipladenia velutina (Mart.) A. DC. in DC. Prodr. 8: 483. 1844; Miers, Apoc. So. Am. 154. 1878.

Dipladenia gentianoides Muell.-Arg. α . *velutina* (Mart.) Muell.-Arg. in Mart. Fl. Bras. 6¹: 124. 1860.

Dipladenia gentianoides Muell.-Arg. α . *velutina* (Mart.) Muell.-Arg. α .* *longiloba* Muell.-Arg. loc. cit. 1860.

Stems, foliage, and calyx tomentose-velutinous or pilose to glabrate; all other essential characters as in the species.

BRAZIL: MINAS GERAES: Lagoa Santa, Dec. 13, 1863, Engle s. n. (C); exact locality lacking, Nov., 1867, Regnell 287 (C, S, US); Aug.–Apr., 1840, Claussen 103 (Bx); exact locality and date lacking, Widgren 371 (Bx, C, M, S, US); RIO DE JANEIRO: exact locality and date lacking, Raben s. n. (C); SÃO PAULO: Taubate, Nov. 23, year lacking, Lund s. n. (C); in campis herbidis udiusculis ad Mogi das Cruzes, Dec., year lacking, Martius 503 (M, TYPE, MBG, photograph and analytical drawings); PARANA: Desirio Ribas, Turma, in campo, alt. 800 m., Oct. 20, 1914, Dusen 1350a (MBG); exact locality lacking, Dec. 7, 1903, Dusen 14749 (US); DATA INCOMPLETE: Raben s. n. (Bx); Sellow 4801 (Bx); Glaziou s. n. (US); Riedel s. n. (G, M).

Var. *glabra* (Muell.-Arg.) Woodson, comb. nov.

Echites Pohliana Stadelm. Flora 24¹: Beibl. 73. 1841; A. DC. in DC. Prodr. 8: 470. 1844.

Echites Pohliana Stadelm. var. α . *angustifolia* Stadelm. loc. cit. 1841.

Echites Pohliana Stadelm. var. β . *latifolia* Stadelm. loc. cit. 75. 1841; A. DC. loc. cit. 1844.

Dipladenia gentianoides A. DC. loc. cit. 484. 1844; Miers, Apoc. So. Am. 157. 1878.

- Anisolobus Pohlianus* (Stadelm.) Miers, loc. cit. 171. 1878.
Dipladenia gentianoides Muell.-Arg. $\beta.$ *glabra* Muell.-Arg.
 in Mart. Fl. Bras. 6¹: 124. pl. 37. fig. 2. 1860.
Dipladenia gentianoides Muell.-Arg. $\beta.$ *glabra* Muell.-Arg.
 1. *ovata* Muell.-Arg. loc. cit. 1860.
Dipladenia gentianoides Muell.-Arg. $\beta.$ *glabra* Muell.-Arg.
 2. *ovata* Muell.-Arg. loc. cit. 1860.
Dipladenia gentianoides Muell.-Arg. $\beta.$ *glabra* Muell.-Arg.
 $\beta.$ * *longiloba* Muell.-Arg. loc. cit. 1860.
Dipladenia gentianoides A. DC. var. *Pohliana* (Stadelm.)
 Malme, Bihang till K. Sv. Vet. Akad. Handl. Afd. III,
 24¹⁰: 20. 1899.
Dipladenia Pohliana (Stadelm.) Handel-Mzt. Denkschr. K.
 K. Akad. Wissensch. Wien 79²: 11. 1910.

Plants glabrous throughout, or essentially so; all other essential characters as in the species.

BRAZIL: BAHIA: Simcora, Nov., year lacking, *Martius* 292 (M, MBG photograph and analytical drawings); MINAS GERAES: Lagoa Santa, Jan. 2, 1864, *Engle* s. n. (C); exact locality and date lacking, *Claussen* 344 (C, MP); RIO DE JANEIRO: Mage, Nov., 1833, *Lund* s. n. (C); SÃO PAULO: Butantan, Nov. 17, 1917, *Hoehne* 896 (G); PARANA: chapado de Tamandua, Nov., 1913, *Luetzelburg* 5000 (M); Serrinha, in campo, Nov. 27, 1911, *Dusen* 15454 (US); Jaguariahyva, in campo, Oct. 27, 1910, *Dusen* 10694 (US); MATTO GROSSO: Cuyaba, 1834, *Manso* 398 (Bx); DATA INCOMPLETE: *Riedel* s. n. (BB, G); *Pohl* s. n. (Bx, MBG, photograph).

PARAGUAY: in regione cursus superioris fluminis Y-aca, Dec., 1900, *Hassler* 6658 (BB); some data *Hassler* 6816 (BB); in regione fluminis Corrientes, Sept., year lacking, *Hassler* 4499 (BB); Cordillera de Altos, Oct., 1902, *Fiebrig* 310 (AA, M); Caaguazu sur les collines incultes, Nov. 7, 1874, *Balansa* 1554 (BB).

M. velutina, *M. illustris*, and *M. cuspidata* apparently offer an interesting example of parallel variation caused by similar ecological conditions.

75. *Mandevilla linearis* (Muell.-Arg.) Woodson, comb. nov.

Dipladenia linearis Muell.-Arg. in Mart. Fl. Bras. 6¹: 123. 1860; Miers, Apoc. So. Am. 157. 1878.

Glabrous, suffrutescent herbs; stems terete, relatively slender; leaves opposite or occasionally ternate, shortly petiolate to subsessile, linear, 5–10 cm. long, 0.2–0.3 cm. broad, firmly membranaceous, eglandular; petiole 0.2–0.3 cm. long; nodal appendages obsolete; racemes simple, terminal, much surpassing

the subtending leaves, bearing 2-6 showy, pinkish flowers; pedicels 1.0-1.25 cm. long; bracts ovate-lanceolate, acuminate, 0.3-0.6 cm. long, scarious; calyx-lobes lanceolate to ovate-lanceolate, acuminate, scarious, 0.5-1.0 cm. long, the squamellae in alternate groups of 4-6; corolla infundibuliform, glabrous without, the proper-tube straight, 1.0-1.25 cm. long, about 0.25 cm. in diameter at the base, the throat broadly tubular, 3.5-4.0 cm. long, about 0.75-1.25 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2.0-2.5 cm. long, spreading; anthers auriculate, 0.7-0.8 cm. long; ovary ovoid-oblongoid, about 0.15 cm. long, glabrous; stigma 0.2 cm. long, rather obscurely apiculate; nectaries 2-3, compressed-ovoid, truncate or somewhat lobed, about half as long as the ovary; follicles unknown.

BRAZIL: MINAS GERAES: exact locality uncertain, 1845, *Widgren* 63 (Bx, TYPE, C, US, MBG, photograph and analytical drawings); SÃO PAULO: exact locality lacking, *Sellow* s. n. (M); PARANA: Turma, in paludosis, Jan. 22, 1910, *Dusen* 9098 (G, US); prope Ponta Grossa, in uliginosis ad flum. Rio Tibagy, alt. 800 m., Jan. 17, 1909, *Dusen* 7542 (MBG).

PARAGUAY: in regione cursus superioris fluminis Jejui-guazu, Dec., year lacking, *Hassler* 5733 (BB).

This species perhaps is only a variety of *M. velutina*.

76. ***Mandevilla coccinea* (Hook. & Arn.) Woodson, comb. nov.**

Echites coccinea Hook. & Arn. in Hook. Jour. Bot. 1: 286. 1834; A. DC. in DC. Prodr. 8: 476. 1844.

Echites (?) *xanthostoma* Stadelm. Flora 24¹: Beibl. 55. 1841; A. DC. loc. cit. 468. 1844.

Dipladenia Saponariae A. DC. loc. cit. 485. 1844.

Dipladenia xanthostoma (Stadelm.) Muell.-Arg. in Mart. Fl. Bras. 6¹: 123. 1860; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 169. 1895.

Dipladenia xanthostoma (Stadelm.) Muell.-Arg. a. *major* Muell.-Arg. loc. cit. 1860.

Dipladenia xanthostoma (Stadelm.) Muell.-Arg. b. *minor* Muell.-Arg. loc. cit. 1860.

Rhodocalyx coccineus (Hook. & Arn.) Miers, Apoc. So. Am. 141. 1878.

- Rhodocalyx ovatus* Miers, loc. cit. 1878.
Echites coccinea Hook. & Arn. var. β . *ovata* Hook. & Arn.
ex Miers, loc. cit. 1878, sphalm in synon.
Rhodocalyx Tweedianus Miers, loc. cit. 142. 1878.
Dipladenia saponaria A. DC. ex Miers, loc. cit. 157. 1878,
sphalm.
Temnadenia xanthostoma (Stadelm.) Miers, loc. cit. 212.
1878.

Glabrous, erect, suffrutescent herbs from a napiform, tuberous root; stems terete, relatively slender; leaves opposite, shortly petiolate to subsessile, lanceolate to ovate or oblong-elliptic, rarely suborbicular, apex acute to acuminate, rarely obtuse, base rounded to broadly obtuse, 3–8 cm. long, 0.75–3.5 cm. long, firmly membranaceous, eglandular or essentially so; petiole 0.2–0.3 cm. long or virtually obsolete; nodal appendages obsolete; racemes simple, terminal, greatly surpassing the subtending leaves, bearing 5–20 showy, pink or rose-red flowers; pedicels 0.75–1.25 cm. long; bracts lanceolate, 0.2–0.5 cm. long, scarious; calyx-lobes lanceolate to ovate-lanceolate, acuminate, 0.6–1.5 cm. long, scarious, the squamellae in alternate groups of 2; corolla infundibuliform, the proper-tube straight, 0.8–1.2 cm. long, about 0.15 cm. in diameter at the base, the throat tubular or subtubular, 0.7–1.5 cm. long, about 0.3–0.5 cm. in diameter at the orifice, the lobes obliquely obovate to obovate-oblong, narrowly acute, 1.4–3.0 cm. long, spreading; anthers auriculate, 0.6 cm. long; ovary oblongoid, about 0.1 cm. long, glabrous; stigma 0.2 cm. long, shortly apiculate; nectaries 2, rarely 3–5, compressed-oblongoid, about as long as the ovary; follicles relatively long and slender, continuous, 20–25 cm. long, glabrous; seeds not examined.

BRAZIL: MINAS GERAES: Caldas, in campis, Nov., 1854, *Lindberg* 193 (Bx, MBG, photograph); Lagoa Santa, Nov. 23, 1863, *Engle* s. n. (C); Caldas, 1862, *Regnell* 875 (Bx, C, M, US); Congonhas do Campo, 1843, *Stephan* s. n. (Bx); "campo," Febr., 1835, *Lund* s. n. (C); data incomplete, *Claussen* s. n. (K); *Widgren* 372 (Bx, C, G, M); SÃO PAULO: in campis herbidet supra saxum aren. ferruginosum prope Mogi et Fundiayh, Dec., year lacking, *Martius* 504 (M, MBG, photograph); PARANA: Villa Velha, in campo, alt. 875 m., Oct. 23, 1914, *Dusen* 1317a (MBG); Jaguariahyva, in campo, Nov. 28, 1915, *Dusen* 17356 (G, US); same locality, Nov. 17, 1914, *Dusen* 16023 (US); Tamandua, in campo, Nov. 24, 1910, *Dusen* 10854a (MBG); Desirio Ribas, in campo, Nov. 29. 1910, *Dusen* 10875 (AA, G); exact locality lacking, Nov.

30, 1903, *Dusen* 14750 (US); Serrinha, in campo, Dec. 7, 1908, *Dusen* 7311 (G); RIO GRANDE DO SUL: prope Rio Jacuhy, date lacking, *Tweedie* 791 (K, TYPE, MBG, photograph); Neuwurtemburg, Estancia Laurenço Gomez, alt. 500 m., Nov. 21, 1904, *Bornmueller* 348 (M); data incomplete, *Sellow* 3203 (Bx); *Glaziou* 15216 (C); *Sellow* 4502 (BB); *Riedel* s. n. (M, BB).

PARAGUAY: in regione fluminis Alto Parana, 1909-10, *Fiebrig* 5677 (G, US); Caaguazu, dans les campos, Nov. 11, 1874, *Balansa* 1353 (K); in regione vicine Igatimi, Oct., year lacking, *Hassler* 4789 (G, K, BB); in altiplanitie et declivibus Sierras de Amambay, Dec., 1907, *Hassler* 9801 (K); in regione cursus superioris fluminis Y-aca, Febr., 1900, *Hassler* 7125 (BB); in regione fluminis Yhú, Nov., 1905, *Hassler* 9609 (G).

URUGUAY: Montevideo, date lacking, *Sellow* 1493 (C).

77. *Mandevilla spigeliaeflora* (Stadelm.) Woodson, comb. nov.

Echites (?) *spigeliaeflora* Stadelm. Flora 24¹: Beibl. 58. 1841; A. DC. in DC. Prodr. 8: 469. 1844.

Echites pulchella Gardn. ex Hook. Icon. Pl. 5: pl. 470. 1842.

Dipladenia pulchella (Gardn.) A. DC. loc. cit. 485. 1844.

Dipladenia longiloba A. DC. loc. cit. 1844; Miers, Apoc. So. Am. 157. 1878.

Dipladenia spigeliaeflora (Stadelm.) Muell.-Arg. in Mart. Fl. Bras. 6¹: 122. pl. 37. fig. 1. 1860; Miers, loc. cit. 1878; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 169. 1895.

Dipladenia spigeliaeflora (Stadelm.) Muell.-Arg. β . *longiloba* (A. DC.) Muell.-Arg. loc. cit. 1860.

Dipladenia xanthostoma (Stadelm.) Muell.-Arg. f. *longiloba* (A. DC.) Malme, Bull. Herb. Boiss. II. 4: 258. 1904.

Glabrous, erect, suffrutescent herbs from a napiform, tuberous root; stems terete, relatively slender; leaves opposite, shortly petiolate to subsessile, lanceolate to narrowly oblong-elliptic, apex acute to acuminate, base obtuse to rounded, 4-9 cm. long, 0.75-2.0 cm. broad, firmly membranaceous, eglandular or essentially so; petiole 0.2-0.3 cm. long; nodal appendages obsolete; racemes simple, terminal, bearing 5-12 showy, pink or rose-red flowers; pedicels 0.75-1.0 cm. long; bracts linear-lanceolate, acuminate, 0.3-0.6 cm. long, scarious; calyx-lobes lanceolate to ovate-lanceolate, acuminate, 0.2-0.6 cm. long, scarious, the squamellae in alternate groups of 2; corolla infundibuliform, the proper-tube straight, 0.4-0.5 cm. long, about 0.25 cm. in diameter

at the base, the throat tubular or subtubular, 1.0–1.5 cm. long, about 0.3–0.5 cm. in diameter at the orifice, the lobes obliquely oblong-elliptic to narrowly obovate, acute, 1.0–1.5 cm. long, spreading; anthers auriculate, 0.45 cm. long; ovary ovoid-oblongoid, about 0.1 cm. long, glabrous; stigma 0.15 cm. long, obscurely apiculate; nectaries 2, rarely 3–5, compressed-ovoid, about half as long as the ovary; follicles unknown.

BRAZIL: MINAS GERAES: Lagoa Santa, Dec. 20, 1865, *Warming s. n.* (C); same locality, Jan. 12, 1864, *Engle s. n.* (C); inter Lapa and Rio das Velhas, in campis humidis, Jan., 1866, *Engle s. n.* (C); Fazenda Secca, date lacking, *Pohl s. n.* (Bx, M, MBG, photograph and analytical drawings); data incomplete: *Claussen* 339 (C, G, MP); *Regnell* 874 (US); MATTO GROSSO: Porto Esperidiad, Rio Jauru, campo, date lacking, *Hoehne* 695 (US).

PARAGUAY: zwischen Rio Apa und Rio Aquidaban, Berg Camp. quellige Stelle, zwischen Gräsern, Centurian, Nov. 16, 1908, *Fiebrig* 4238 (G, M, US); in regione cursus superioris fluminis Apa, Dec., 1901, *Hassler* 8143 (BB, G).

Closely related to *M. coccinea*, and possibly better interpreted as a variety of it. *M. spigeliaeflora* has also been reported from the Brazilian states of Goyaz and São Paulo.

Subgen. II. EXOTHOSTEMON (G. Don) Woodson, comb. nov.

Exothostemon G. Don, Hist. Dichlam. Pl. 4: 82. 1838, pro. gen.

Corolla-tube more or less gibbous or arcuate; squamellae as many as the calyx-lobes and opposite them (frequently deeply lacerate in certain species); upper surface of leaves bearing few to several glandular emergences distributed rather irregularly along the midrib. *Spp.* 78–108.

KEY TO THE SPECIES

- a. Corolla salverform, the orifice somewhat constricted.
- b. Flowers subsessile, ascending at maturity; leaves firmly chartaceous to subcoriaceous, sagittate.
 - c. Bracts scarious, 0.4–0.6 cm. long; leaves glabrous or rarely minutely puberulent to glabrate; plants of Venezuela and the Guianas. 78. *M. subspicata*
 - cc. Bracts petaloid, 0.75–1.25 cm. long; leaves pubescent to glabrate; plants of Peru, Bolivia, and Brazil.
 - d. Bracts abruptly obtuse to broadly acute. 79. *M. antennacea*
 - dd. Bracts gradually acuminate. 80. *M. bracteosa*
- bb. Flowers short-pedicellate, somewhat reflexed or resupinate at maturity; leaves delicately membranaceous, somewhat auriculate.
 - c. Bracts scarious, 0.1–0.5 cm. long. 81. *M. subsagittata*

- cc. Bracts foliaceous or petaloid, 1.0-3.5 cm. long 82. *M. villosa*
- aa. Corolla infundibuliform, or infundibuliform-subsilverform, the orifice not constricted.
 - b. Lianas; stems terete.
 - c. Corolla relatively large and showy, yellow or reddish; inflorescence not secund.
 - d. Corolla infundibuliform-subsilverform, the throat narrowly tubular or subtubular, not greatly inflated.
 - e. Corolla-tube relatively slender, about 0.1 cm. in diameter at the base; calyx-lobes ovate-lanceolate, acute to acuminate, 0.2-0.3 cm. long; plants of Peru 83. *M. Pavonii*
 - ee. Corolla-tube relatively stout, about 0.3 cm. in diameter at the base; calyx-lobes lanceolate, acuminate, 0.4-0.5 cm. long; plants of southern Brazil 84. *M. lasiocarpa*
 - dd. Corolla typically infundibuliform, the throat conical to narrowly campanulate (broadly tubular in *M. Sagittariae*), greatly inflated.
 - e. Bracts scarious, relatively inconspicuous.
 - f. Leaves smooth or somewhat rugose above, softly tomentose to glabrate, infrequently glabrous; calyx-lobes acuminate.
 - g. Corolla-throat conical to conical-campanulate.
 - h. Bracts ovate to lanceolate, 0.6 cm. long or less; foliar indument not ferruginous if present; species of Colombia, Trinidad, Venezuela, the Guianas, and northern Brazil.
 - i. Leaves broadly ovate to ovate-oblong, rarely oblong-lanceolate; corolla-throat conical-campanulate; follicles short and stout, conspicuously moniliform. 85. *M. mollissima*
 - i. Leaves broadly elliptic to linear-lanceolate; corolla-throat conical; follicles relatively long and slender, continuous or only slightly articulated.
 - j. Leaves broadly elliptic to elliptic-lanceolate; inflorescence several- to many-flowered.
 - k. Corolla 4-7 cm. long; vegetative parts velutinous-pilose to glabrate.
 - l. Leaves firmly membranaceous, smooth above. 86. *M. scabra*
 - ll. Leaves coriaceous, rugose above 87. *M. rugosa*
 - kk. Corolla 9-10 cm. long; vegetative parts glabrous to glabrate. 88. *M. symphitocarpa*
 - jj. Leaves linear to linear-elliptic; inflorescence few- to several-flowered. 89. *M. leptophylla*
 - hh. Bracts linear, about 1 cm. long; foliar indument ferruginous; plants of Bolivia. 90. *M. rutila*
 - gg. Corolla-throat narrowly campanulate.
 - h. Corolla-throat relatively broad, 1.0-1.25 cm. in diameter at the orifice. 91. *M. Fendleri*
 - hh. Corolla-throat relatively narrow, about 0.75 cm. in diameter at the orifice.

- i. Leaves narrowly elliptic-lanceolate, the base attenuate, not cordate; flowers subsessile..... 92. *M. Schlimii*
- ii. Leaves broadly ovate-lanceolate, conspicuously and narrowly cordate; flowers distinctly pedicellate..... 93. *M. Trianae*
- ff. Leaves scabrous, strigillose above; calyx-lobes ovate-reniform, broadly obtuse or rounded..... 94. *M. scaberula*
- ee. Bracts foliaceous or petaloid, large and showy.
- f. Bracts ovate to ovate-lanceolate, sessile.
- g. Leaves puberulent to glabrate above; follicles relatively slender and flexile..... 95. *M. bracteata*
- gg. Leaves strigillose above; follicles relatively stout and rigid.
- h. Corolla-throat conical to conical-campanulate..... 96. *M. hirsuta*
- hh. Corolla-throat broadly tubular..... 97. *M. sagittaria*
- ff. Bracts oblanceolate or spatulate, with a slender claw..... 98. *M. Moritziana*
- cc. Corolla relatively small and inconspicuous, greenish-yellow; inflorescence secund..... 99. *M. polyantha*
- bb. Low, erect, or very rarely somewhat volubile, suffruticose undershrubs; stems alate or more or less compressed.
- c. Bracts scarious, relatively small and inconspicuous.
- d. Leaves strictly opposite.
- e. Plants glabrous or essentially so.
- f. Leaves obovate to obovate-lanceolate, or oblong-elliptic.
- g. Calyx glabrous; leaves chartaceous..... 100. *M. caurensis*
- gg. Calyx minutely papillate; leaves coriaceous.
- h. Leaves elliptic to obovate-lanceolate, attenuate and somewhat cuneate at the base; pedicels 0.1–0.3 cm. long.
- i. Stems conspicuously alate; leaves 5–8 cm. long; corolla 4.5–6.0 cm. long; stigma obscurely apiculate..... 101. *M. Vanheurckii*
- ii. Stems inconspicuously alate; leaves 10–12 cm. long; corolla 8 cm. long; stigma long-apiculate..... 102. *M. Ulei*
- hh. Leaves broadly oblong-elliptic, rounded and obscurely cordate at the base; pedicels 0.4–0.6 cm. long..... 103. *M. subcarnosa*
- ff. Leaves linear-lanceolate..... 104. *M. lancifolia*
- ee. Plants densely pubescent..... 105. *M. anceps*
- dd. Leaves verticillate..... 106. *M. Benthamii*
- cc. Bracts foliaceous or petalaceous, large and showy.
- d. Bracts not navicular or conduplicate, the apex rounded or broadly obtuse; corolla 6–8 cm. long..... 107. *M. javitensis*
- dd. Bracts somewhat navicular or conduplicate, the apex long-acuminate; corolla 5–7 cm. long..... 108. *M. Spruceana*

78. Mandevilla subspicata (Vahl) Mgf. Rec. Trav. Bot. Néér. 22: 380. 1926.

Echites subspicata Vahl, Eclog. Am. 2: 18. 1798; A. DC. in DC. Prodr. 8: 467. 1844.

Echites Guianensis A. DC. loc. cit. 458. 1844.

Echites Prieurei A. DC. loc. cit. 1844.

Amblyanthera Guianensis (A. DC.) Muell.-Arg. *Linnaea* 30: 448. 1860.

Amblyanthera Prieurei (A. DC.) Muell.-Arg. loc. cit. 1860.

Angadenia Prieurii (A. DC.) Miers, *Apoc. So. Am.* 182. 1878, sp. n.

Mesechites Guianensis (A. DC.) Miers, loc. cit. 235. 1878.

Laseguea venustula Miers, loc. cit. 252. 1878.

Laseguea subspicata (Vahl) Miers, loc. cit. 1878.

Suffruticose lianas; stems terete, relatively stout, minutely and sparsely pilose when young, soon becoming glabrate; leaves opposite, petiolate, rather broadly ovate-lanceolate, apex rather gradually acuminate, base somewhat sagittate, 8–12 cm. long, 3.5–7.0 cm. broad, chartaceous to subcoriaceous, either surface glabrous or infrequently minutely puberulent to glabrate beneath, the upper glandular along the midrib; petiole about 0.5 cm. long; inflorescence lateral, simply racemose, about equalling the length of the subtending leaves, bearing 8–20 whitish or cream-colored flowers; pedicels 0.1 cm. long, or somewhat less, ascending, not reflexed or resupinate at the maturity of the flowers; bracts lanceolate, 0.4–0.6 cm. long, scarious; calyx-lobes lanceolate, acuminate, 0.1–0.3 cm. long, scarious, glabrous, the opposite, solitary squamellae trigonal-ligular, frequently slightly erose or laciniate; corolla salverform, glabrous without, the tube about 2.0–2.25 cm. long, about 0.15 cm. in diameter at the base, somewhat narrowing toward the insertion of the stamens, more or less gibbous, but not ventricose, the lobes obliquely obovate, 1.5 cm. long, widely spreading or reflexed; anthers auriculate, 0.4 cm. long; ovary ovoid, about 1.5 cm. long, glabrous; stigma 0.3 cm. long, shortly apiculate; nectaries 5, compressed-ovoid, about half as long as the ovary; follicles relatively slender, glabrous, remotely and rather indistinctly articulated, falcate or somewhat divaricate, 10–15 cm. long; seeds about 1 cm. long, the brilliant tawny coma 1.5–2.0 cm. long.

VENEZUELA: Catalina, May, 1896, *Rusby & Squires* 293 (K, NY, US).

BRITISH GUIANA: Anabisi River, Northwest District, Febr. 14, 1922, *Cruz* 1535 (FM); exact locality lacking, 1840, *Talbot s. n.* (K).

DUTCH GUIANA: Para District, date lacking, *Wüllschlagel* 1972 (B); Aboutjoeman, May 16, 1910, *Landlouw* 297 (B); Saramacca superiore, date lacking, *Pulle* 493 (B); Coppenname superiore, date lacking, *Boon* 1120 (B); exact locality and date lacking, *Hostmann & Kappler* 123 (S); *von Rohr* s. n. (B, drawing, C); *von Rohr* s. n. (C, TYPE, B, drawing, MBG, photograph and analytical drawings).

FRENCH GUIANA: among shrubs, near wireless station, vicinity of Cayenne, July 3, 1921, *Broadway* 643 (NY); Charoni, date lacking, *Wackenheim* 254 (US); Cayenne, date lacking, *Martin* s. n. (K); Godebert, Dec., 1919, *Wackenheim* 68 (K); Cayenne, date lacking, *Perrotet* s. n. (DL); Cayenne, date lacking, *le Blond* s. n. (H); DATA INCOMPLETE: 1855, *Sagot* 382 (BM, K, V); 1820, *le Prieur* s. n. (DL); 1834, *le Prieur* 241 (DC).

79. *Mandevilla antennacea* (A. DC.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4^e: 171. 1895.

Echites antennacea A. DC. in DC. Prodr. 8: 456. 1844.

Amblyanthera antennacea (A. DC.) Muell.-Arg. Linnaea 30: 448. 1860.

Laseguea antennacea (A. DC.) Miers, Apoc. So. Am. 251. 1878.

Echites Boliviiana Britton in Rusby, Mem. Torrey Bot. Club 4: 219. 1895.

Mandevilla Boliviiana (Britton) Rusby, Bull. Torrey Bot. Club 25: 496. 1898.

Echites altescandens H. Winkl. in Fedde, Rep. Sp. Nov. 7: 243. 1909.

Mandevilla tenuicarpa Rusby, Bull. N. Y. Bot. Gard. 8: 114. 1912.

Suffruticose lianas; stems terete, relatively stout, softly puberulent when young, becoming glabrate; leaves opposite, petiolate, elliptic-ovate to oblong-lanceolate, apex acute to acuminate, base obscurely sagittate, 5–12 cm. long, 1.5–6.0 cm. broad, chartaceous to subcoriaceous, above minutely strigillose to glabrate, glandular along the midrib, beneath softly tomentulose or puberulent, particularly along the veins; petiole 0.5 cm. long; inflorescence lateral, simply racemose, usually equalling or somewhat exceeding the length of the subtending leaves, bearing 8–50 crowded, yellowish flowers; pedicels 0.1–0.2 cm. long; bracts oblong, obtuse to broadly acute, 0.75–1.25 cm. long, petaloid; calyx-lobes lanceolate to oblong-lanceolate, acuminate, 0.2–0.3 cm. long, scarious, glabrous or minutely and irregularly puberulent-papillate, the opposite, solitary squamellae subtri-

gonal, erose; corolla salverform, glabrous without, the tube 2.5–3.0 cm. long, about 0.2 cm. in diameter at the base, distinctly gibbous, slightly enlarged at the insertion of the stamens, the lobes obliquely ovate or obovate, reflexed or spreading, 1.5–2.0 cm. long; anthers auriculate, 0.4 cm. long; ovary ovoid, about 0.2 cm. long, glabrous; stigma 0.15 cm. long, obscurely apiculate; nectaries 5, ovoid-trigonal, about half as long as the ovary; follicles slender, obscurely articulated, 8–20 cm. long; seeds about 0.75 cm. long, the brilliant tawny coma about 2 cm. long.

PERU: JUNIN: Chanchamayo Valley, alt. 1000 m., Feb., 1924–27, Schunke 391 (FM); same locality, alt. 1200 m., Dec., 1924–27, Schunke 389 (FM); Colonia Perene, alt. about 680 m., thickets, June 14–25, 1929, Killip & Smith 25407 (US); LORETO: stromgebiet des Maranon von Jiquitos aufwärts bis zur Santiago-Mündung am Pongo de Manseriche, ca. 77° 30' West., Feb. 12, 1925, Tessmann 5064 (B); same locality and date, Tessmann 5587 (B); Moyobamba, alt. 800–900 m., Aug. 7, 1904, Weberbauer 4488 (B); Yurimaguas, Rio Huallaga, loco non inundabili, Febr. 15, 1924, Kuhlmann 21849 (B, US).

BOLIVIA: LA PAZ: Ixiamas, alt. 800 ft., Dec. 11, 1921, White 1142 (K, NY, US); Guani, alt. 2000 ft., May, 1886, Rusby 2380 (G, K, NY, FM, US); same locality and date, Rusby 2379 (NY); Tumupassa, alt. 1800 ft., Williams 875 (B, BM, K, NY); Yungas, 1890, Bang 551 in part (FM, MBG, NY, US); Charopampa, vicinity of Mapiri, Schlingstrauch viele Metr. hoch steigend, alt. 570 m., Nov., 1907, Buchtien 1968 (US); Polo-Polo, bei Coroico, Nordyungas, alt. 1100 m., Oct.–Nov. 1912, Buchtien 4072 (US); same locality and date, Buchtien 5918 (US); Mapiri, alt. 1800 ft., Sept. 17, 1901, Williams 804 (BM, NY, US); Tumupassa, Dec., 1901, Williams 538 (BM, NY); Mapiri Región: San Carlos bei Sarampiuni, alt. 600 m., Nov. 10, 1926, Buchtien 1198 (US); exact locality and date lacking, Bang 2057 (NY, US).

BRAZIL: AMAZONAS: Santo Antonio do Yea, Aug. 26, 1906, Ducke 21768 (B).

80. *Mandevilla bracteosa* (Rusby) Woodson, comb. nov.

Echites bracteosa Rusby, Mem. N. Y. Bot. Gard. 7: 325.
1927.

Suffruticose lianas; stems terete, relatively stout, densely hirtellous to glabrate; leaves opposite, petiolate, broadly oblong-to ovate-elliptic, apex acuminate, base obscurely sagittate, 7–12 cm. long, 2.5–5.0 cm. broad, chartaceous to subcoriaceous, above minutely strigillose, beneath densely and minutely tomentulose; petiole 0.5–0.75 cm. long; racemes lateral, somewhat longer than the subtending leaves, bearing 15–20 showy, reddish-yellow flowers; pedicels 0.1–0.2 cm. long; bracts extremely conspicuous, petaloid, narrowly lanceolate, long-acuminate, 1.0–1.25 cm. long; calyx-lobes ovate-lanceolate, acuminate, about 0.2 cm. long,

scarious, minutely and sparsely puberulent without, the opposite, solitary squamellae deltoid, entire or merely somewhat erose; corolla salverform, glabrous without, the tube distinctly gibbous, 2.25 cm. long, about 0.1 cm. in diameter at the base, somewhat dilated at the insertion of the stamens, minutely puberulent-papillate without, the lobes broadly obovate, 0.75 cm. long, reflexed or sharply spreading; stamens inserted somewhat above midway within the corolla-tube, the anthers auriculate, 0.5 cm. long; ovary oblongoid, 0.1 cm. long, glabrous; nectaries 5, ovoid-quadratae, about half as long as the ovary; stigma 0.15 cm. long, shortly apiculate; follicles slender, rather indistinctly articulate or torulose, 15–20 cm. long, glabrous; seeds about 1 cm. long, the pale tawny coma 2.5 cm. long.

BOLIVIA: LA PAZ: Ixiamas, alt. 700–800 ft., Dec. 16, 1921, White 1142 (NY, TYPE, MBG, photograph and analytical drawings).

This species is somewhat dubiously regarded as distinct from *M. antennacea* (A. DC.) K. Sch. on the grounds of the more attenuate, petaloid bracts. Additional specimens may prove the two species to intergrade.

81. *Mandevilla subsagittata* (R. & P.) Woodson, Ann. Mo. Bot. Gard. 19: 69. 1932.

Echites subsagittata R. & P. Fl. Peruv. 2: 19. 1799; A. DC. in DC. Prodr. 8: 475. 1844; Miers, Apoc. So. Am. 198. 1878.

Echites hirtella HBK. Nov. Gen. 3: 213. 1819; A. DC. loc. cit. 465. 1844.

Echites gracilis HBK. loc. cit. 219. 1819; A. DC. loc. cit. 460. 1844.

Echites speciosa HBK. loc. cit. 1819; A. DC. loc. cit. 1844.

Echites mucronata R. & S. Syst. 4: 796. 1819.

Exothostemon gracile (HBK.) G. Don, Hist. Dichlam. Pl. 4: 82. 1838; Miers, loc. cit. 240. 1878.

Exothostemon speciosum (HBK.) G. Don, loc. cit. 1838; Miers, loc. cit. 241. 1878.

Echites Guayaquilensis Benth. Pl. Hartw. 119. 1839.

Echites jasminiflora Mart. & Gal. Bull. Acad. Roy. Brux. 11: 357. 1844.

- Echites microcalyx* A. DC. loc. cit. 456. 1844; Miers, loc. cit. 203. 1878.
Echites microcalyx A. DC. β . *glabra* A. DC. loc. cit. 1844.
Echites hirtiflora A. DC. loc. cit. 1844; Miers, loc. cit. 200. 1878.
Echites membranacea A. DC. loc. cit. 457. 1844; Miers, loc. cit. 196. 1878.
Echites secundiflora A. DC. loc. cit. 1844.
Amblyanthera membranacea (A. DC.) Muell.-Arg. Linnaea 30: 423. 1860.
Amblyanthera microcalyx (A. DC.) Muell.-Arg. loc. cit. 428. 1860.
Amblyanthera microcalyx (A. DC.) Muell.-Arg. α . *hirtiflora* (A. DC.) Muell.-Arg. loc. cit. 1860.
Amblyanthera microcalyx (A. DC.) Muell.-Arg. β . *trichantha* Muell.-Arg. loc. cit. 1860.
Amblyanthera microcalyx (A. DC.) Muell.-Arg. γ . *leiantha* Muell.-Arg. loc. cit. 429. 1860.
Echites acuminata Willd. ex Muell.-Arg. loc. cit. 1860, nom. nud. in synon., not R. & P.
Amblyanthera microcalyx (A. DC.) Muell.-Arg. δ . *leiophylla* Muell.-Arg. loc. cit. 1860.
Amblyanthera microcalyx (A. DC.) Muell.-Arg. ϵ . *glabra* (A. DC.) Muell.-Arg. loc. cit. 1860.
Temnadenia secundiflora (A. DC.) Miers, loc. cit. 211. 1878.
Mesechites hastata Miers, loc. cit. 233. 1878.
Mesechites Guayaquilensis (Benth.) Miers, loc. cit. 1878.
Mesechites hirtella (HBK.) Miers, loc. cit. 234. 1878.
Mesechites jasminiflora (Mart. & Gal.) loc. cit. 235. 1878.
Echites cuspidifera S. F. Blake, Contr. Gray Herb. 52: 79. 1917.

Glabrous or variously pubescent, suffrutescent lianas; stems terete, relatively slender; leaves opposite, petiolate, oblong-elliptic, infrequently narrowly lanceolate, apex somewhat gradually acuminate, rarely abruptly obtuse or rounded, mucronulate, base rather gradually narrowed and abruptly auriculate, commonly almost subhastate, 2–10 cm. long, 0.5–3.0 cm. broad, membranaceous, the upper surface glandular along the midrib;

petiole 0.5–1.0 cm. long; racemes lateral, equaling or somewhat surpassing the subtending leaves, bearing 8–20 alternate, yellow or reddish flowers; pedicels 0.4–0.6 cm. long, more or less reflexed and resupinate at maturity; bracts lanceolate, 0.1–0.5 cm. long, scarious; calyx-lobes narrowly trigonal, 0.1–0.15 cm. long, scarious, glabrous to scatteringly pilosulous, the opposite, solitary squamellae trigonal-ligular, usually more or less erose; corolla salver-form, the tube 2.0–2.5 cm. long, about 0.2 cm. in diameter at the base, conspicuously narrowing toward the insertion of the stamens, more or less gibbous and ventricose below, the lobes broadly and obliquely obovate, acuminate, 1.0–1.5 cm. long, reflexed or widely spreading; stamens inserted near the orifice of the corolla-tube, the anthers auriculate, 0.5 cm. long; ovary oblong-ovoid, about 0.15 cm. long, glabrous; stigma 0.3 cm. long, shortly apiculate; nectaries 5, compressed ovoid, usually retuse, about half as long as the ovary; follicles relatively slender, conspicuously moniliform, 10–20 cm. long, glabrous; seeds about 0.75 cm. long, the tawny coma about 1.5 cm. long.

MEXICO: TABASCO: entre San Juan Bautista y "El Cometa" (Fabarco), July 9, 1888, *Revirosa* 225 (PA, K); road to San Juan Bautista to Atasta (Fabarco), March 14, 1888, *Revirosa* 128 (PA, US); MICHOACAN: Chaveta, Oct. 26, 1898, *Langlassé* 519 (B, G, K, US); OAXACA: near Pchutla, alt. 200 m., Sept. 28–Nov. 4, 1917, *Reko* 3411 (US); Las Friaas Aguas, Distrito de Cuitacan, Aug. 21, 1909, *Conzatti* 3514 (US); vicinity of Choapam, alt. 3800–4500 ft., July 28–29, 1894, *Nelson* 866 (US); near Totonepec, alt. 5500–5700 ft., July 15–28, 1894, *Nelson* 809 (US); Ixcatlan, Aug. 19, 1895, *L. C. Smith* 660 (G); Tentilla, alt. 3300 ft., Aug. 16, 1895, *L. C. Smith* 691 (G); exact locality lacking, alt. 4000 pp., date lacking, *Galeotti* 1602 (Bx); VERA CRUZ: region of Orizaba, July 12, 1865–66, *Bourgeau* 2710 (B, BB, Bx, G, K, S, US); Wartenberg, near Tantoyuca, Prov. Huasteca, 1858, *Ervendberg* 217 (G, BB); Zazuapan and vicinity, Nov., 1906, *Purpus* 2215 (FM, G, MBG, US); Misantla, July, 1912, *Purpus* 5906 (BM, FM, G, MBG); Zazuapan, Aug., 1914, *Purpus* 7281 (AA, BM, FM, MBG, US); open forest, Zazuapan, July, 1926, *Purpus* 10739 (S, US); hillsides, same locality, Oct., 1926, *Purpus* 10885 (S, US); Vera Cruz, July, 1838, *Linden* 359 (BB, K); little woods near Vera Cruz, date lacking, *Galeotti* 1575 (Bx, K); YUCATAN: exact locality lacking, 1895, *Gaumer* 881 (BM, FM); at Buena Vista, Xbac, date lacking, *Gaumer* 1158 (US); at San Anselmo, date lacking, *Gaumer* 2013 (FM, MBG); Chichankanab, date lacking, *Gaumer* 2014 (BM, C, FM, S, US); same locality, *Gaumer* 2228 (C, FM, G, MBG, S, US); Merida, Oct., year lacking, *Moritz* 1153 (K, B); data incomplete: *Schiede* 167 (B); *Sartorius s. n.* (B).

GUATEMALA: IXABAL: Los Amates, Feb. 15, 1908, *Kellermann* 7564 (NY); bushy slope, vicinity of Quirigua, alt. 75–225 m., May 15–31, 1922, *Standley* 24512 (US); Christina, in slough, May 23, 1919, *Blake* 7651 (US); GUATEMALA: near Guatemala City, Aug., 1921, *Tonduz* 827 (NY, US); Guatemala City, 1892, *Heyde* 172 (US); on the plains, near Guatemala, towards Chinatán, July, 1860, *Hayes* 318 (FM, G, US);

forest along Saklak River, alt. 300 m., below Secanquim, May 7, 1905, Pittier 304 (US); Secanquim, trail to Setzapec, Nov. 28, 1904, Goll 95 (US); near Cajabon, near the Finca Sepaxuite, April 26, 1902, Cook & Griggs 769 (US); Monte Blanco, alt. 1000 m., June, 1902, Tuerckheim 3369 (US); SANTA ROSA: Cenaguilla, alt. 4000 pp., Sept., 1892, Heyde & Lux 3992 (B, C, K, MBG, NY, US); Cerro Redondo, alt. 1500 m., Oct. 1893, Heyde & Lux 6186 (B, BB, BM, G, K, US); BAJA VERAPAZ: locality lacking, Oct., 1912, Tuerckheim 3924 (FM, US).

BRITISH HONDURAS: lower Belize River, Febr., 1926, Record s. n. (K, US); Honey Camp, Orange Walk, 1928, Lundell s. n. (FM, K, MBG, US); climber growing over low bushes in swampy places, Stann Creek Railway, alt. 50 ft., Sept. 22, 1929, Schipp 368 (AA, BM, FM, G); Pine Ridge, near Manatee Lagoon, June 11, 1905, Peck 35 (G).

HONDURAS: SANTA BARBARA: San Pedro Sula, alt. 300 m., April, 1890, Thieme 5347 (G, US); same locality, Nov., 1888, Thieme 5346 (US); COMAYAGUA: pine forest, vicinity of Siguatepeque, Dept. Comayagua, alt. 1080–1400 m., Febr. 14–27, 1928, Standley 56470 (FM); same locality and date, Standley 56365 (FM); DEPARTMENT UNCERTAIN: La Cumbre, on oaks and pines, Oct. 26, 1888, Thieme 517 (US); La Cumbre, mountainside, Oct. 7, 1888, Thieme 622 (US, K); Bonacce Island, 1887, Gaumer s. n. (US).

COSTA RICA: ALAJUELA: hills of Santiago, near San Ramon, May 25, 1901, alt. 1100 m., Brenes 14273 (B, G); DATA INCOMPLETE: April, 1910, Worthen s. n. (MBG).

SALVADOR: San Salvador, 1922, Calderon 815 (US).

NICARAGUA: MATAGALPA: Monte Grande, alt. 1050 m., Sept. 2, 1894, Rothschild 614 (B).

PANAMA: Punta Bruja, Sept., 1924, Stevens 538 (US); Mirador, date lacking, Sartorius s. n. (B, US); Panama Sta., July, 1861, Hayes 345 (BM, K).

COLOMBIA: CUNDINAMARCA: open road bank, Caqueza to Rio Sananie, alt. 1600 m., Aug. 24, 1917, Pennell 1330 (G); Copo, Vallée du Magdalena, alt. 1200 m., 1851–57, Triana s. n. (BM); META: trail in thicket, Villavicencio, alt. 500 m., Aug. 26–31, 1917, Pennell 1390 (G, US); grassy liano, east of Villavicencio, alt. 450 m., Sept. 1–2, 1917, Pennell 1633 (NY); MAGDALENA: Santa Marta, alt. 250 ft., Oct., 1898–1901, H. H. Smith 1662 (B, BM, Bx, K, MBG, US); Santa Marta, 1898–1901, H. H. Smith 2413 (B, FM, K, MBG, NY, US); Santa Marta, date lacking, Purdie s. n. (K); prope Santa Marta, July, 1832, Linden 987 (BB, K); S. Ana Nova-Granatentium, date lacking, Humboldt & Bonpland s. n. (B); ANTIOQUIA: vicinity of Medellin, April 15, 1927, Toro 163 (NY); VALLE DEL CAUCA: La Manuelita, near Palmira, eastern side of Cauca Valley, alt. 1100–1302 m., Dec., 1906–Jan. 1907, Pittier 810 (NY).

VENEZUELA: SUCRE: Island of Margarita, San Juan, alt. 750 m., July 11, 1903, Johnston 157 (G); MERIDA: savannas, Meseta near Tovar, alt. 1100 m., Jan. 30, 1928, Pittier 12778 (MC, US); CARABOBO: between Valencia and Campanero, also Biscaina, alt. 300 m., 1854–55, Fendler 1033 (G, K, MBG, NY); San Estevan, Dec., 1843, Linden 1503 (BM, DL); MIRANDA: Quebrada de Turumo, cerca de Guarenas, Dec. 2, 1923, Pittier 11278 (MC, US); Las Mostazas, ferro-carril de Los Teques a Tejerias, alt. 963 m., Nov., 1924, Allart 203 (MC); La Cortada, en la carretera a Guatire, cerca de Petare, en matorrales, Nov. 11, 1923, Pittier 11228 (MC, US); DISTRITO FEDERAL: hills above Los Teques, in brushes, Sept. 7, 1924, Pittier 11597 (MC, NY, US); La Guagra, Caracas, July 1, 1874, Kunze 1331 (NY); Caracas, 1829, Vargas 109 (DC); bosques de Catuche, cerca de Caracas, en lugares asoleados, Aug. 7, 1921,

Pittier 9650 (MC, NY, US); *Cotiza*, cerca de Caracas, en matorrales, Aug. 8, 1917, *Pittier 7300* (MC); El Valle, Caracas, June 25, 1891, *Eggers 13168* (US); **LARA**: Rio de Sarare, alt. 300–450 m., Aug. 3, 1930, *Saer s. n.* (MC); **ARAGUA**: Valle de Ocumare de la Costa, en silva humeda, Oct. 13, 1927, *Pittier 12558* (MC); **ZULIA**: mountains near Guayabo, alt. 4–5000 ft., Dec., 1854, *Birscher s. n.* (K).

TRINIDAD: Trinidad, April, 1874, *Kunze 689* (NY); Carenage, hillside thicket, March 29, 1921, *Britton & Broadway 2620* (NY, US); road to Maracas Bay, South, Sept. 14, 1927, *Broadway 6733* (K, US); St. Anne's Cascade, Dec. 4, 1923, *Broadway s. n.* (MBG); exact locality and date lacking, *Sieber 92* (B, DC, DL, K, MBG, S); Maracas Falls, June 11, 1903, *Johnston 53* (G); Oroponche, along the roadside, Dec. 19, 1907, *Nurse 2158* (B, FM); Darrell Spring Road, June 29, 1910, *Broadway 3848* (B, BM, FM, S); Belmont Valley Road, Nov. 8, 1909, *Broadway 2840* (B, FM); exact locality and date lacking, *Lockhart s. n.* (K); Maraval Valley, April, 1848, *Purdie s. n.* (K); Radix Point, Mayaro, July 3, 1927, *Williams & Sampson 11735* (K); exact locality lacking, 1877–80, *Fendler 622, 624* (BM); Tobago, prope Bacolet, in collibus, Oct. 20, 1889, *Eggers 5482* (B, US).

ECUADOR: GUAYAS: Guayaquil, 1837, *Hartweg 669* (BM, Camb., DL, K); Guayaquil, date lacking, *Pavon s. n.* (BB); exact locality lacking, April 12, 1897, *Eggers s. n.* (B, FM).

PERU: HUANUCO: Pozuzo, June 20–22, 1923, *Macbride 4720* (FM); Casapi, 1835, *Matthews 1977* (K); LORETO: prope Tarapoto, *Peruvia Orientalis*, 1855–56, *Spruce s. n.* (K, V); Tarapoto, 1835, *Matthews 1327* (K); CAJAMARCA: Tal des Flusses Tabaconas, bei der Hacienda Charape, Prov. Taén, alt. 1200–1300 m., April 21, 1912, *Weberbauer 6270* (B); *Peruvia subandina*, in fruticetis ad Chihuameala, Pr. Cuchero, July, 1829, *Poeppig 1233* (V); DATA INCOMPLETE: *Poeppig 144* (BB).

M. subsagittata is probably the most variable species of the genus *Mandevilla*. Although the variability expresses itself chiefly in the presence and character of pubescence, such factors as the outline and size of the leaf, length of petiole and pedicel, and size of flower have also been found unstable. Mueller was inclined to view the collective species as interpreted above as consisting of at least five distinct varieties. Other writers, notably Kunth, A. de Candolle, and Miers, were able to distinguish several species within the complex.

82. *Mandevilla villosa* (Miers) Woodson, Ann. Mo. Bot. Gard. 19: 70. 1932.

Laseguea villosa Miers, Apoc. So. Am. 250. 1878.

Echites comosa O. Ktze. Rev. Gen. 2: 414. 1891.

Suffrutescent lianas; stems terete, relatively slender, finely pilose to glabrate; leaves opposite, petiolate, elliptic to obovate-elliptic, apex rather abruptly acuminate, base obscurely auriculate, commonly almost subhastate, 3–9 cm. long, 1.5–4.0 cm. broad, membranaceous, beneath finely and densely pilose, infrequently

glabrate, rarely glabrous, above finely and rather sparsely pilose to glabrate, not infrequently glabrous or essentially so, glandular along the midrib; petiole 0.4–2.5 cm. long; racemes lateral, equalling or somewhat surpassing the subtending leaves, bearing 8–20 alternate, yellowish or reddish flowers; pedicels 0.2–0.4 cm. long, more or less reflexed and resupinate at maturity; bracts lanceolate to ovate-lanceolate, 1.0–3.5 cm. long, foliaceous or petaloid; calyx-lobes narrowly trigonal, acute to acuminate, 0.1–0.15 cm. long, scarious, puberulent-papillate to glabrate, the opposite, solitary squamellae triangular-ligular; corolla salverform, finely and sparsely pilose to glabrate without, the tube more or less gibbose and ventricose below, 1.5–2.0 cm. long, about 0.2 cm. in diameter at the base, finely and rather sparsely pilose to glabrate without, the lobes obliquely obovate-oblong, 1.0–1.5 cm. long, reflexed or widely spreading; stamens inserted about midway within the corolla-tube, the anthers 0.4 cm. long, auriculate; ovary oblong-ovoid, about 0.15 cm. long, glabrous; stigma 0.2 cm. long, shortly apiculate; nectaries 5, compressed-ovoid, about half as long as the ovary; follicles relatively slender, conspicuously moniliform, 10–15 cm. long; seeds about 0.75 cm. long, the pale tawny coma about 1.5 cm. long.

MEXICO: CHIAPAS: Sierra de Tonala, Sept., 1913, Purpus 6929 (MBG, US).

GUATEMALA: RETALHULEU: Rio Samala, alt. 1100 pp., Oct., 1891, Shannon 218 (US); Retalhuleu, Oct., 1866–78, Bernoulli & Cario 1821 (K); SOLOLA: Santa Barbara, alt. 1370 pp., Aug., 1891, Shannon 251 (US).

NICARAGUA: exact locality lacking, 1848, Seemann 95 (K, BM).

SALVADOR: San Salvador, July, 1922, Calderon 938 (NY, US).

COSTA RICA: Rio Toro Amarillo, Llanuras de Santa Clara, alt. 300 m., July 1899, Pittier 7598 (US).

PANAMA: COLON: Colon, July 11, 1874, Kuntze 1891 (NY); PANAMA: Sabana de Juaguito, near Chejo, alt. 60–80 m., 1911, Pittier 4756 (US); CANAL ZONE: Gatun Sta., Oct., 1859, Hayes 116 (G, US); France Field, Oct., 1924, Stevens 1006 (US); Cerro Gordo, near Culebra, alt. 50–290 m., June 29, 1911, Pittier 3738 (US, MBG); Barbour Point, Barro Colorado Isl., Aug. 29–30, 1929, Bangham 494 (AA).

VENEZUELA: AMAZONAS: San Carlos, upper Rio Negro, July, 1853, Spruce 3051 (K); in Orinoci ripis, frequens, June, 1856, Spruce 3599 (K).

Among the species of subgen. *Exothostemon* there appears an interesting and perplexing parallelism of scarious and subfoliaceous bracted groups. *M. villosa* differs from *M. subsagittata* in the size and character of the floral bracts and in no other evident and consistent feature. Likewise, *M. bracteata* and *M. mollissima*

are separable upon the same character. In *M. antennacea* the floral bracts reach a greater development than in the closely-related *M. subspicata*. In all but the last-mentioned species, the scarious and subfoliaceous-bracted forms occupy almost identical geographical ranges. Quite possibly the greater development of the bracts may not represent an actual specific criterion, and those species differing from their nearest relatives only in that respect and usually occupying a more restricted range and found only in fewer numbers, may be in reality only varieties or even forms of a parent species. However, specific rank has provisionally been assigned to scarious- and subfoliaceous-bracted forms in the absence of intergrading specimens and an intimate knowledge of the plants in the field.

83. *Mandevilla Pavonii* (A. DC.) Woodson, Ann. Mo. Bot. Gard. 19: 73. 1932.

Echites hirsuta R. & P. Fl. Peruv. 2: 19. pl. 136. 1799; Miers, Apoc. So. Am. 198. 1878, not A. Rich.

Prestonia hirsuta (R. & P.) Spreng. Syst. 1: 637. 1825.

Echites Pavonii A. DC. in DC. Prodr. 8: 463. 1844.

Amblyanthera Pavonii (A. DC.) Muell.-Arg. Linnaea 30: 450. 1860.

Suffruticose lianas; stems terete, relatively stout, ferruginous-hispid to glabrate; leaves opposite, petiolate, elliptic-obovate, apex abruptly subcaudate-acuminate, base rather obscurely auriculate, 8–11 cm. long, 3–5 cm. broad, membranaceous, above minutely strigillose, glandular along the midrib, beneath minutely ferruginous-tomentulose; petiole 1.25–2.5 cm. long; racemes lateral, somewhat shorter than the subtending leaves, bearing 10–15 showy, reddish-yellow flowers; pedicels 0.6–0.8 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-lanceolate, acute to acuminate, 0.2–0.3 cm. long, scarious, minutely tomentulose, the opposite, solitary squamellae trigonal, truncate; corolla infundibuliform-subsalverform, puberulent without, the tube 3.0–3.5 cm. long, inconspicuously gibbous, somewhat inflated above the insertion of the stamens, about 0.1 cm. in diameter at the base, 0.3–0.35 cm. in diameter at the orifice, the lobes obliquely obovate, 2.0–2.25 cm. long, widely spreading; stamens inserted somewhat

above midway within the corolla-tube, the anthers auriculate, 0.45 cm. long; ovary oblongoid-ovoid, about 0.2 cm. long, glabrous or minutely papillate; stigma 0.2 cm. long, shortly apiculate; nectaries 5, oblongoid, about as long as the ovary; mature follicles unknown.

PERU: LORETO: Mishuyacu, near Iquitos, alt. 100 m., forest, April, 1930, Klug 1288 (US); same locality, Oct.-Nov., 1929, Klug 57 (US); in fruticetis ad missionem Tocache, June, 1830, Poeppig 1840 (V).

84. *Mandevilla lasiocarpa* (A. DC.) Malme, Bihang till K. Sv. Vet. Akad. Handl. Afd. III. 24¹⁰: 25. 1899.

Echites hirsuta R. & P. *β. angustifolia* Stadelm. Flora 24: Beibl. 26. 1841.

Echites lasiocarpa A. DC. in DC. Prodr. 8: 463. 1844.

Echites lasiocarpa A. DC. *β. angustifolia* (Stadelm.) A. DC. loc. cit. 1844.

Echites lasiocarpa γ. *Lobbiana* A. DC. loc. cit. 464. 1844.

Temnadenia Lobbiana (A. DC.) Miers, Apoc. So. Am. 209. 1878.

Temnadenia lasiocarpa (A. DC.) Miers, loc. cit. 210. 1878.

Suffrutescent lianas; stems terete, relatively stout, ferruginous-hispida to glabrate; leaves opposite, petiolate, obovate-elliptic, apex abruptly acuminate, base auriculate, 8–13 cm. long, 3.5–7.0 cm. broad, membranaceous, above minutely strigillose, glandular along the midrib, beneath densely tomentulose; petiole 1–3 cm. long; racemes lateral, usually somewhat shorter than the subtending leaves, bearing 5–15 showy, reddish-yellow flowers; pedicels 0.5–0.75 cm. long; bracts lanceolate, 0.2–0.5 cm. long; calyx-lobes lanceolate, acuminate, 0.4–0.5 cm. long, more or less petaloid in color and texture, variously pilose to tomentulose, the opposite, solitary squamellae trigonal-ligular; corolla infundibuliform-subsalverform, puberulent or pilose without, 2.0–2.75 cm. long, the tube about 0.3 cm. in diameter at the base, narrowing toward the insertion of the stamens, more or less gibbous, but not ventricose, somewhat inflated above the insertion of the stamens, about 0.5 cm. in diameter at the orifice, the lobes broadly and obliquely obovate, shortly acuminate, 2.0–2.25 cm. long, widely spreading; stamens inserted near the orifice of the corolla-tube; anthers auriculate, 0.5 cm. long; ovary ovoid, about

0.15 cm. long, glabrous; stigma 2 cm. long, shortly apiculate; nectaries 5, ovoid, nearly as long as the carpels; follicles relatively stout, conspicuously articulated or moniliform, 8–15 cm. long; seeds about 0.75 cm. long, the brilliant tawny coma about 1.5 cm. long.

BRAZIL: PARA: Serra de Santarem, silvula secundaria, May 13, 1927, Ducke 21600 (B, US); MATTO GROSSO: Cuyaba, May 12, 1893, Malme 1196, same locality, in dumetis silvulis riparum rivularum, June 28, 1902, Malme s. n. (S); same locality, in silvula ripa rivulis, June 17, 1902, Malme s. n. (S).

Although subsequent data may prove the present plants to represent merely a variety of *M. hirsuta*, *M. lasiocarpa* possesses several distinctive characteristics which appear to entitle it to specific rank. Foremost of these is the construction of the corolla-throat, which is narrowly tubular-cylindrical, differing very markedly from that of *M. hirsuta* which is broadly conical or campanulate.

85. *Mandevilla mollissima* (HBK.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 171. 1895.

Echites mollissima HBK. Nov. Gen. 3: 218. 1819; A. DC. in DC. Prodr. 8: 461. 1844.

Exothostemon mollissimum (HBK.) G. Don, Hist. Dichlam. Pl. 4: 82. 1838; Miers, Apoc. So. Am. 240. 1878.

Suffruticose lianas; stems terete, relatively slender, velutinous-puberulent to glabrate; leaves opposite, petiolate, broadly ovate to ovate-oblong, rarely oblong-lanceolate, apex obtuse to abruptly acuminate, base obscurely cordate, 2–6 cm. long, 1.5–3.0 cm. broad, membranaceous, above softly velutinous to glabrate, sparsely glandular along the midrib, beneath densely tomentulose; petiole 0.2–0.5 cm. long; racemes lateral, usually somewhat shorter than the subtending leaves, bearing 4–8 reddish-yellow flowers; pedicels 0.1–0.3 cm. long; bracts narrowly lanceolate, 0.4–0.6 cm. long, scarious; calyx-lobes lanceolate, acuminate, 0.2–0.3 cm. long, scarious, puberulent to glabrate, the opposite, solitary squamellae trigonal, entire or somewhat erose; corolla typically infundibuliform, pilose to glabrate without, the proper-tube gibbous, 2.5–3.0 cm. long, about 0.15 cm. in diameter at the base, the throat conical-campanulate, 2.0–2.5 cm. long, about 1.5 cm. in diameter at the orifice, the lobes obliquely obovate,

acuminate, 2.0–2.75 cm. long, spreading; anthers auriculate, 0.7–0.8 cm. long; ovary ovoid, about 0.15 cm. long; stigma 0.2 cm. long, shortly apiculate; nectaries 5, oblongoid-ovoid, about as long as the ovary; follicles relatively stout, conspicuously moniliform, 3–9 cm. long, densely and minutely velutinous; seeds about 0.6 cm. long, the brilliant tawny coma about 1.5 cm. long.

COLOMBIA: CUNDINAMARCA: open slope above Pandi, alt. 1300–1600 m., Dec. 1–3, 1917, *Pennell 2817* (G); open loam, Fusagasuga to Pandi, alt. 1000–1300 m., Nov. 30, 1917, *Pennell 2726* (G); Callandaima & Missiones, near Bogota, April–May, *Tracey 54* (K); Bogota, March 29, 1925, *Schultze 193* (B); vicinity of Pandi, Dec., 1842, *Linden 863* (DL); TOLIMA: La Mesa, Prov. Mariquita, alt. 1300 m., 1851–57, *Triana s. n.* (BM); Dolores, alt. 1000–1200 m., date lacking, *Lehmann 7581* (FM, K, B); Honda y alrededores, March, 1868, *Stibel 74* (B); open slope, Libano, alt. 1000–1200 m., Dec. 26–29, 1917, *Pennell 3443* (G); HUILA: open rocky foothill, Cordillera Oriental, east of Neiva, alt. 600–1000 m., July 31, 1917, *Rusby & Pennell 404* (NY); open grassy slope, Cordillera Oriental, east of Neiva, Aug. 1–8, 1917, *Rusby & Pennell 1032* (NY); La Plata, date lacking, *Lehmann 704* (NY, K); VALLE DEL CAUCA: prope Cali, alt. 1030 m., April, 1876, *Andrè 2497* (K); ANTIOQUIA: Titiribi, alt. 1700 m., Aug. 31, 1930, *Archer 573* (US); NARIÑO: Prov. Pasto, alt. 1500 m., 1851–57, *Triana s. n.* (BM); MAGDALENA: prope S. Ana Nova Granatensis, date lacking, *Humboldt & Bonpland s. n.* (B); exact locality and date lacking, *Mutis 97* (Linn.).

86. *Mandevilla scabra* (R. & S.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 171. 1895.

Echites scabra R. & S. Syst. 4: 795. 1819.

Echites pubiflora G. Don, Hist. Dichlam. Pl. 4: 73. 1838.

Echites Maranhensis G. Don, loc. cit. 74. 1838.

Echites brachystachya Benth. in Hook. Jour. Bot. 3: 248. 1841.

Echites versicolor Stadelm. Flora 24¹: Beibl. 38. 1841; A. DC. loc. cit. 461. 1844.

Echites tenuicaulis Stadelm. loc. cit. 40. 1841; A. DC. loc. cit. 1844.

Echites Cuyabensis A. DC. loc. cit. 462. 1844.

Amblyanthera Cuyabensis (A. DC.) Muell.-Arg. in Mart. Fl. Bras. 6¹: 145. 1860.

Amblyanthera versicolor (Stadelm.) Muell.-Arg. loc. cit. 146. 1860.

Angadenia reticulata Miers, Apoc. So. Am. 179. 1878.

Mitozus versicolor (Stadelm.) Miers, loc. cit. 221. 1878.

Mitoxus tenuicaulis (Stadelm.) Miers, loc. cit. 1878.

Mitoxus brachystachyus (Benth.) Miers, loc. cit. 222. 1878.

Mitoxus Cuyabensis (A. DC.) Miers, loc. cit. 223. 1878.

Mandevilla parvifolia K. Sch. in Engl. Bot. Jahrb. 40: 163. 1907, nom. nud.

Suffruticose lianas; stems terete, relatively stout, puberulent or pilose to glabrate, infrequently glabrous; leaves opposite, petiolate, elliptic to oblong-elliptic, apex acute to abruptly acuminate, base rather obscurely cordate, firmly membranaceous, above softly puberulent to glabrate, infrequently glabrous, smooth, sparsely glandular along the midrib, beneath minutely tomentulose to glabrate, rarely glabrous, 4–12 cm. long, 1.5–6.0 cm. broad; petiole 0.2–0.6 cm. long; racemes lateral, bearing 3–10 showy, reddish-yellow flowers; pedicels 0.1–0.4 cm. long; bracts narrowly lanceolate, acuminate, 0.1–0.5 cm. long, scarious; calyx-lobes lanceolate to ovate-lanceolate, acuminate, 0.2–0.3 cm. long, scarious, puberulent to glabrate, infrequently glabrous, the solitary, opposite squamellae trigonal-ligular; corolla typically infundibuliform, puberulent to glabrous without, the proper-tube gibbous, 1.5–3.0 cm. long, about 0.15 cm. in diameter at the base, the throat conical, 1.25–2.0 cm. long, 1.0–1.5 cm. in diameter at the orifice, the lobes obliquely obovate, 1.5–2.0 cm. long, spreading; anthers 0.7 cm. long, auriculate; ovary ovoid, about 0.2 cm. long, glabrous or somewhat papillate; stigma 0.2 cm. long, shortly apiculate; nectaries 5; oblongoid to ovoid, about as long as the ovary; follicles slender, continuous or slightly articulated, 10–25 cm. long, glabrous or very sparsely and minutely puberulent; seeds about 0.7 cm. long, the brilliant tawny coma about 1.5 cm. long.

COLOMBIA: SANTANDER: Bucaramanga and vicinity, thickets, alt. about 1000 m., Dec. 28, 1926, Killip & Smith 16181 (US).

VEZUELA: BOLIVAR: Ciudad Bolivar, alt. 25 m., Nov. 4–25, 1929, Holt & Gehrig 208 (US); AMAZONAS: Puerto Ayacucho, alt. about 100 m., May, 1931, Holt & Blake 789 (MBG, US).

BRITISH GUIANA: dry sandstone hills, east of Rockstone, July 23–30, 1921, Gleason 774 (G, NY); swampy banks of Cuyuni River, Kartabo, Aug. 12, 1920, Bailey 104 (G); upper Rupununi River, near Dadanawa, lat. 2° 45' N., July 24–29, 1922, Cruz 1763 (FM, G, PA); Quinatta, Rupununi River, Oct., 1889, Jenman 5550 (BM, K, NY, US); upper Rupununi River, June 10, 1867, Appun 2351 (K); twining on bushes, Mazaruni River, Sept., 1880, Jenman 739 (K); Savannah, Oreale, Courantyne River, Sept. 1879, Jenman 151 (K); Demerara, date lacking, Parker 259 (K); savannah, exact locality lacking, June, 1871, Pollard 40 (K); junction of Mazaruni and

Cuyuni Rivers, July 18, 1924, *Graham* 289 (MBG); exact locality and date lacking, *Appun* 1838 (K).

FRENCH GUIANA: Mana, 1856, *Sagot* 386 (K); exact locality lacking, 1833, *le Prieur s. n.* (DL).

DUTCH GUIANA: prope Paramaribo, date lacking, *Wüllschlagel* 319 (Bx, V); Zauberg, savanne, date lacking, *Pulle* 78 (B); data incomplete, *Hostmann & Kappler s. n.* (B).

BRAZIL: PARA: "in vicinibus Santarem [?]," March, 1850, *Spruce s. n.* (B, BB, BM, DL, G, K); in a walk through the low grounds near the river, beyond (or N. of) Campinha, thence eastwards to the sandy high ground, and then southwestwardly into the Nazara road near the Longo de Polvora, Dec. 30, 1829, *Burchell* 10026 (Bx, K); Montealegre, silva non inundata, date lacking, *Kuhlmann* 21854 (B); Ilha do Mosqueiro, near Para, sandy coast, Nov. 3-9, 1929, *Killip & Smith* 30422 (US); campos do Ariramba, region fl. Trombetos, Dec. 13, 1910, *Ducke* 21646 (B); BAHIA: circa Bahiam, Aug., 1832, *Blanchet* 677 (NY); Moritiba, 1841, *Blanchet* 3467 (BB, NY, V); Bomfim, May 8, 1918, *Curran* 158 (G); in fruticosis, 1830, *Salzmann* 320 (DC, K); common about Bahia, twining among shrubs, Sept., 1837, *Gardner* 894 (BM, Camb., K); 1842, *Blanchet* 3637 (BM, DL, V); St. Thomas, int. Jacobina et Villanova, 1845, *Blanchet* 3797 (BB, BM); date lacking, *Lhotzky* 224 (B); Vittoria, Brasilia meridionalis, 1836, *Sello* 212 (B); partie merid., 1840, *Blanchet* 3185A (BB, DC, DL); CEARA: 1838, *Gardner* 1755 (B, BB, BM, DL, K, NY, US); Guaramiranga, alt. 3000 ft., about 50 miles inland, date lacking, *Bolland* s. n. (K); near Serra da Araripe in "coapuera," April 21, 1910, *Loefgren* 636 (S); Sussuanha in "coapuera," March 18, 1910, *Loefgren* 339 (S); RIO GRANDE DO SUL: prope São Gabriel da Cachoeira, ad Rio Negro, Jan.-Aug. 1852, *Spruce* 2206 (B, Bx, BB, BM, DL, G, K, V); MINAS GERAES: Bello Horizonte, 1918, *Gehrt* 3185 in part (B); AMAZONAS: about 64° W, 30° S., June 24, 1874, *Trail s. n.* (K); Camanãos, Rio Negro, Dec. 22, 23, 1930, *Holt & Blake* 578, 593 (US); campaio, bei S. Marcos, same locality, June, 1909, *Ule* 7825 (K); Ayrão, Rio Negro, June 16, 1874, *Trail* 522 (K); Manãos, March 12, 1924, *Kuhlmann* 21874 (B); Boa Vista, Rio Branco super., silvula secondaria, July 1913, *Kuhlmann* 3645 (B); Manãos, ad margines silvarum, Jan. 16, 1924, *Kuhlmann* 21855 (B); uferwald bei Boa Vista, Rio Branco, Oct., 1908, *Ule* 7681 (B); Manãos, über Cachoerinha, May 21, 1903, *Goeldi* 21767 (B); campanas an der Porte Negro, May, 1902, *Ule* 6920 (B); São Gabriel, Rio Negro, alt. about 90 m., Dec. 1930-Jan., 1931, *Holt & Blake* 614 (MBG, US); RIO DE JANEIRO: near Rio Janeiro, 1878-79, *Glaziou* 11180 (K, S); Petropolis, Dec. 13, 1890, *Rudolph* s. n. (B); SÃO PAULO: Visconde do Rio Claro, Aug. 9, 1888, *Loefgren* 11154 (B, S); Ubatuba, Santos, May 5, 1892, *Hoehne* 11153 (B); Mogy-Mirim, in fruticeto humido scandens, March 15, 1874, *Regnell* 1402 (S); MARANHÃO: bushy places, June, 1841, *Gardner* 6058 (BM, K); GOIAS: Mission of Duro, Oct., 1839, *Gardner* 3320 (K); Nossa Senhora d'Abadia, June, 1840, *Gardner* 4271 (BM, K); MATTO GROSSO: Cataqui-Imain, Jan., 1918, *Kuhlmann* 3254 (B); data incomplete: *Glaziou* s. n. (NY); *Blanchet* 3023 (BM); 1842, *Blanchet* 3636 (BB, BM); 1832, *Manso* 2 (DC).

87. Mandevilla rugosa (Benth.) Woodson, Ann. Mo. Bot. Gard. 19: 384. 1932.

Echites rugosa Benth. in Hook. Jour. Bot. 3: 248. 1841;
A. DC. in DC. Prodr. 8: 460. 1844.

Amblyanthera versicolor (Stadelm.) Muell.-Arg. *β. intermedia*

Muell.-Arg. in Mart. Fl. Bras. 6¹: 146. 1860, in part.

Mitorus rugosus (Benth.) Miers, Apoc. So. Am. 222. 1878.

Suffruticose lianas; stems terete, relatively stout, pilose-puberulent to glabrate or glabrous; leaves opposite, shortly petiolate, broadly elliptic to elliptic-lanceolate, apex acute to obtuse, mucronulate, base obtuse or very obscurely cordate, 4–7 cm. long, 1.5–3.0 cm. broad, coriaceous or subcoriaceous, rugose above, finely puberulent to glabrate or glabrous, sparsely glandular along the midrib, beneath finely puberulent to tomentulose; petiole 0.5 cm. long; racemes lateral, somewhat shorter than the subtending leaves, bearing 5–18 showy, reddish-yellow flowers; pedicels 0.2–0.3 cm. long; bracts minutely ovate-lanceolate, acuminate, scarious; calyx-lobes ovate-lanceolate, acuminate, 0.1–0.15 cm. long, scarious, minutely puberulent-papillate, the opposite, solitary squamellae trigonal, minutely erose; corolla typically infundibuliform, pilosulose without, the proper-tube narrowly gibbous or arcuate, 2.5–3.0 cm. long, about 0.2 cm. in diameter at the base, the throat conical, 1.5–1.75 cm. long, about 1.5 cm. in diameter at the orifice, the lobes obliquely obovate, 1.25 cm. long, widely spreading; anthers 0.75 cm. long, auriculate; ovary ovoid-oblongoid, about 0.4 cm. long, glabrous; stigma 0.25 cm. long, obscurely apiculate; nectaries 5, about half as long as the ovary; mature follicles unknown.

BRITISH GUIANA: exact locality and date lacking, Schomburgk 350 (B, BB, BM, DC, K, TYPE, MBG, photograph and analytical drawings); upper Rupununi River, near Dadanawa, lat. 2° 45' N., July 24–29, 1922, Cruz 1753 (G).

BRAZIL: PARA: date lacking, Wulschlagel 1508 (V); BAHIA: Bomfim, May 8, 1918, Curran 158 (G); exact locality and date lacking, Tamberlik s. n. (V, MBG, photograph).

88. *Mandevilla symphitocarpa* (G. F. W. Mey.) Woodson, Ann. Mo. Bot. Gard. 19: 70. 1932.

Echites symphitocarpa G. F. W. Mey. Prim. Fl. Esseq. 132. 1818; A. DC. in DC. Prodr. 8: 467. 1844.

Mitorus symphitocarpus (G. F. W. Mey.) Miers, Apoc. So. Am. 222. 1878.

Suffruticose lianas; stems terete, relatively stout, glabrous, infrequently somewhat puberulent to glabrate; leaves opposite,

petiolate, ovate- to oblong-lanceolate, apex acute to acuminate, base cordate, 8–15 cm. long, 3–6 cm. broad, firmly membranaceous, above glabrous, glandular along the midrib, beneath glabrous, infrequently somewhat puberulent to glabrate; petioles 0.5–1.25 cm. long; racemes lateral, about as long as the subtending leaves, bearing 5–20 showy, yellow, reddish-flushed flowers; pedicels 0.3–0.5 cm. long; bracts lanceolate, 0.1–0.4 cm. long, scarious; calyx-lobes lanceolate, acuminate, 0.3–0.5 cm. long, scarious, glabrous, the opposite, solitary squamellae trigonal, entire or somewhat erose; corolla typically infundibuliform, glabrous without, the proper-tube gibbous, 3.0–3.5 cm. long, about 0.2 cm. in diameter at the base, the throat conical, 3.0–3.5 cm. long, about 2 cm. in diameter at the orifice, the lobes obliquely obovate, 2.75–3.0 cm. long, spreading; anthers 0.7–0.8 cm. long, auriculate; ovary oblongoid-ovoid, about 0.3 cm. long, glabrous; stigma 0.2 cm. long, shortly apiculate; nectaries 5, ovoid, about as long as the ovary; mature follicles unknown.

BRITISH GUIANA: Mt. Everard, Northwest District, Febr. 12, 1922, Cruz 1299 (NY); Anabisi River, Northwest District, Febr. 15, 1922, Cruz 1347 (NY); Penal Settlement, May, 1905, Waly 8362 (NY); Anabisi River, Northwest District, Febr. 14, 1922, Cruz s. n. (NY); exact locality lacking, 1916, Taylor s. n. (NY); Upper Rupununi River, near Dadanawa, lat. 2° 45' N., June 13, 1922, Cruz 1474 (NY); sandy soil, bank of canal, Covenden, Demerara River, Febr. 2, 1923, Persaud 74 (FM).

FRENCH GUIANA: le Mana, 1856, Sagot 886 (K, V).

DUTCH GUIANA: near the 2n or Oude Ryweg, Paramaribo, May 23, 1916, Samuels 457 (NY, K).

TRINIDAD: Irois, March, 1888, Crueger 39 (B, K); Erin, near the sea, Febr. 7, 1908, Broadway 2844 (B); Cap-de-Ville road, five miles from Erin, March 27, 1908, Broadway 2228 (B); Cap-de-Ville, Nov. 14, 1915, Broadway 7369 (NY).

89. *Mandevilla leptophylla* (A. DC.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 171. 1895.

Echites linearifolia Stadelm. Flora 24¹: Beibl. 18. 1841,
not Ham.

Echites leptophylla A. DC. in DC. Prodr. 8: 455. 1844.

Mitozus leptophyllus (A. DC.) Miers, Apoc. So. Am. 220.
1878.

Mandevilla linearis N. E. Br. Trans. Linn. Soc. Bot. II. 6:
48. 1901.

Suffruticose lianas; stems terete, relatively slender, puberulent
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to glabrate; leaves opposite, petiolate, linear to linear-elliptic, apex acuminate, base gradually attenuate, rarely obscurely cordate, 3–7 cm. long, 0.2–0.6 cm. broad, firmly membranaceous to subcoriaceous, above glabrous, sparsely glandular along the midrib, beneath finely puberulent; petiole 0.2–0.3 cm. long; racemes lateral, somewhat shorter than the subtending leaves, bearing 1–4 showy, reddish-yellow flowers; pedicels 0.1–0.3 cm. long; bracts narrowly lanceolate, 0.1–0.4 cm. long, scarious; calyx-lobes ovate to ovate-lanceolate, 0.1–0.2 cm. long, scarious, glabrous to sparsely puberulent-papillate, the opposite, solitary squamellae trigonal-ligular; corolla typically infundibuliform, glabrous or somewhat pilosulose without, the proper-tube gibbous, 2.0–2.5 cm. long, about 0.15 cm. in diameter at the base, the throat rather narrowly conical, 1.5–2.0 cm. long, about 1 cm. in diameter at the orifice, the lobes obliquely obovate, 1.75–2.25 cm. long, spreading; anthers 0.7 cm. long, auriculate; ovary ovoid-oblongoid, about 0.2 cm. long; stigma 0.2 cm. long, shortly apiculate; nectaries 5, ovoid-oblongoid, about as long as the ovary; follicles slender, conspicuously articulated or moniliform, 10–15 cm. long; seeds about 0.8 cm. long, the brilliant tawny coma about 1.5 cm. long.

BRAZILIAN GUIANA: Mt. Roraima, humid, sloping, deeply shaded ground in the Weitipu Forest, Arabupu, alt. 4200 ft., Jan. 1, 1928, Tate 228 (K, NY); Kotinga Valley, 1894, Quelch & McConnell 132, 194 (K); Rupununi, Jan., 1842, Schomburgk 383 (B).

BRAZIL: AMAZONAS: Serra de Mairary, Surumu, Rio Branco, alt. 900–1200 m., Sept., 1909, Ule 8450 (K, B).

90. *Mandevilla rutila* Woodson, Ann. Mo. Bot. Gard. 19: 385. 1932.

Suffruticose lianas; stems terete, relatively slender, softly ferruginous-pilosulose to glabrate; leaves opposite, petiolate, elliptic to elliptic-obovate, apex acuminate, base obscurely auriculate, 8–15 cm. long, 3–5 cm. broad, membranaceous, above somewhat ferruginous-pilose and glandular along the midrib, beneath pale ferruginous- or yellowish-pilosulose; petiole 0.5–1.0 cm. long; racemes lateral, usually somewhat shorter than the subtending leaves, bearing 10–25 showy, reddish-yellow flowers; pedicels 0.3–0.5 cm. long; bracts linear or filiform, about 1 cm.

long; calyx-lobes ovate-lanceolate, long-acuminate, 0.2–0.4 cm. long, scarious, the opposite, solitary squamellae deltoid, somewhat lacerate; corolla typically infundibuliform, rather sparsely pilose without, the proper-tube more or less gibbous or arcuate toward the insertion of the stamens, 1.75–2.25 cm. long, about 0.15 cm. in diameter at the base, the throat conical-campanulate, 1.0–1.5 cm. long, 0.8–1.0 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 1.2–1.8 cm. long, widely spreading; anthers 0.4 cm. long, auriculate; ovary ovoid, about 0.15 cm. long, glabrous; stigma 0.2 cm. long, shortly apiculate; nectaries 5, oblongoid, about half as long as the ovary; follicles relatively slender, conspicuously articulated, 15–20 cm. long; seeds 0.5 cm. long, the brilliant tawny coma 2 cm. long.

BOLIVIA: LA PAZ: Mapiri, alt. 5000 ft., April 1886, *Rusby* 2385 (NY, TYPE, MBC, photograph and analytical drawings); Hacienda Simaco, sobre el camino a Tipuani, alt. 1400 m., Jan., 1920, *Buchtien* 5100 (G, US); Hacienda Casana, sobre el camino a Tipuani, alt. 1400 m., Sept. 8, 1923, *Buchtien* 7441 (US); Mapiri region, San Carlos, am wege nach San Jose, alt. 800 m., Jan. 29, 1927, *Buchtien* 1197 (US).

91. *Mandevilla Fendleri* (Muell.-Arg.) Woodson, Ann. Mo. Bot. Gard. 19: 70. 1932.

Amblyanthera Fendleri Muell.-Arg. Linnaea 30: 417. 1860;
Miers, Apoc. So. Am. 190. 1878.

Suffruticose lianas; stems terete, relatively stout, finely velutinous to glabrate; leaves opposite, shortly petiolate, narrowly elliptic- or linear- to ovate-lanceolate, apex acuminate, base rather obscurely cordate, 5–12 cm. long, 1.5–6.0 cm. broad, firmly membranaceous, above minutely puberulent to glabrate, sparsely glandular along the midrib, beneath minutely velutinous to glabrate; petiole 0.5–2.0 cm. long; racemes lateral, somewhat shorter than the subtending leaves, bearing 3–8 showy, reddish-yellow flowers; pedicels 0.2–0.4 cm. long; bracts narrowly lanceolate, 0.2–0.5 cm. long, scarious; calyx-lobes lanceolate, acuminate, 0.2–0.3 cm. long, scarious, minutely puberulent, the opposite, solitary squamellae trigonal-ligular; corolla typically infundibuliform, pilose without, the proper-tube gibbous, 1.0–2.25 cm. long, about 0.15 cm. in diameter at the base, the throat narrowly campanulate, 1.5–2.5 cm. long, about 1.0–1.25 cm. in diameter at the orifice, the lobes obliquely obovate, 1.5–2.25 cm. long,

spreading; anthers 0.7 cm. long, auriculate; ovary ovoid, about 0.2 cm. long, shortly apiculate; nectaries 5, compressed-ovoid, about as long as the ovary; follicles relatively slender, moniliform, 10–20 cm. long, minutely puberulent to glabrate, infrequently glabrous; seeds 0.8 cm. long, the brilliant-tawny coma about 1.5 cm. long.

COLOMBIA: SANTANDER: woods, vicinity of California, alt. 2300 m., Jan. 11–27, 1927, Killip & Smith 17054 (AA, US); open hillside, between Piedecuesta and Las Vegas, alt. 1200–2000 m., Dec. 19, 1926, Killip & Smith 15469 (US); META: Villavicencio, Jan., 1876, André 1173 (K); CUNDINAMARCA: Ubalá, Prov. Bogotá, Oct., 1855, Triana s. n. (BM); Pacho, alt. 1500–2000 m., Jan., 1892, Lehmann 7580 (B); JURADO: clearing, La Cumbre, El Valle, alt. 1600–2000 m., May 12–18, 1922, Pennell 5405 (B, NY, US); thicket, La Cumbre, El Valle, alt. 1600–2100 m., Sept. 25–27, 1922, Killip 11602 (G, US); wayside, La Cumbre, El Valle, alt. 1600–1800 m., Sept. 10, 1922, Hazen & Killip 11168 (NY); CALDAS: thickets, San José, alt. 1500–1800 m., Sept. 3, 1922, Pennell 10251 (NY); moist rill-bank, northeast of Armenia, alt. 1300–1500 m., July 24–25, 1922, Pennell, Killip & Hazen 8686 (NY); dry open wayside, Supia, alt. 1200–1500 m., Sept. 18, 1922, Pennell 10703 (G); ANTIOQUIA: Titiribí, vicinity of Medellín, Aug. 20, 1927, Toro 391 (NY); Angelopolis, vicinity of Medellín, Jan. 22, 1928, Toro 928 (NY); moist bank, north of Caramanta, alt. 2000–2200 m., Sept. 19, 1922, Pennell 10783 (G, US); bushy slopes of hill west of Paso de Caramanta, Rio Caucá, alt. 700–1000 m., Sept. 20, 1922, Pennell 10820 (G, US).

VEZUELA: MERIDA: prope coloniam Tovar, 1854–55, Fendler 1032 (Bx, BB, TYPE, K, MBG); in nemor. subalpinis, exact locality and date lacking, Moritz 1899 (BM, K, V).

92. *Mandevilla Schlimii* (Muell.-Arg.) Woodson, Ann. Mo. Bot. Gard. 19: 70. 1932 (as *M. Schlimii*).

Amblyanthera Schlimii Muell.-Arg. Linnaea 30: 419. 1860;
Miers, Apoc. Só. Am. 189. 1878.

Suffruticose lianas; stems terete, relatively slender, minutely puberulent to glabrate; leaves opposite, shortly petiolate, narrowly elliptic-lanceolate, apex acuminate, base attenuate and somewhat decurrent, 3–6 cm. long, 0.5–1.0 cm. broad, subcoriaceous, above glabrous and somewhat rugose, beneath minutely and densely puberulent; petiole 0.3–0.5 cm. long; racemes lateral, somewhat shorter than the subtending leaves, bearing 3–8 showy, reddish-yellow flowers; pedicels 0.1–0.2 cm. long; bracts lanceolate, 0.1–0.2 cm. long, scarious; calyx-lobes lanceolate- to ovate-trigonal, 0.1–0.2 cm. long, scarious, minutely puberulent to glabrate, the opposite, solitary squamellae trigonal-ligular; corolla typically infundibuliform, minutely puberulent to glabrate without, the proper-tube gibbous, 1.0–1.25 cm. long, about

0.15 cm. in diameter at the base, the throat narrowly campanulate, 1.0–1.25 cm. long, about 0.75 cm. in diameter at the orifice, the lobes obliquely obovate, 1.0 cm. long, spreading; anthers 0.6 cm. long, auriculate; ovary ovoid, about 0.15 cm. long, glabrous; stigma 0.2 cm. long, shortly apiculate; nectaries 5, ovoid-oblongoid, somewhat shorter than the ovary; follicles unknown.

COLOMBIA: SANTANDER DEL NORTE: Ocafia, alt. 6000 ft., May, 1846–52, *Linden* 575 (BB, TYPE, Bx, K, MBG, photograph and analytical drawings); Rio Frio, alt. 7000–8000 ft., Jan. 17, 1881, *Kalbreyer* 1955 (B, K); CUNDINAMARCA: Gachala & Ubala, alt. 1000 m., Prov. Bogota, 1851–1857, *Triana s. n.* (BM).

93. Mandevilla Trianae Woodson, Ann. Mo. Bot. Gard. 19: 70. 1932.

Suffruticose lianas; stems terete, relatively slender, softly puberulent-hirtellous to glabrate; leaves opposite, shortly petiolate, ovate to broadly ovate-lanceolate, apex acute to acuminate, base narrowly cordate, 6–12 cm. long, 2–4 cm. broad, membranaceous, above minutely puberulent to glabrate, glandular along the midrib, beneath puberulent; petiole 0.3–0.6 cm. long; racemes lateral, equaling or slightly surpassing the subtending leaves, bearing 6–10 showy, reddish-yellow flowers; pedicels 0.4–0.6 cm. long; bracts lanceolate, 0.4–0.5 cm. long, scarious; calyx-lobes lanceolate, acuminate, 0.1–0.2 cm. long, scarious, minutely puberulent, the opposite, solitary squamellae deltoid, minutely erose; corolla typically infundibuliform, minutely puberulent to glabrate without, the proper-tube gibbous, 1.75–2.0 cm. long, about 0.15 cm. in diameter at the base, the throat narrowly campanulate, 1.5–1.75 cm. long, about 0.7 cm. in diameter at the orifice, the lobes obliquely obovate, 1.5 cm. long, spreading; anthers 0.4 cm. long, auriculate; ovary oblongoid, about 0.15 cm. long, minutely puberulent; stigma 0.2 cm. long, shortly apiculate; nectaries 5, oblongoid, about half as long as the ovary; follicles unknown.

COLOMBIA: CHOCO: exact locality lacking, alt. 150 m., April, 1853, *Triana* 3409 (BM, TYPE, MBG, photograph and drawings); VALLE DEL CAUCA: Cordoba, Dagua Valley, Pacific Coastal Zone, alt. 30–100 m., Dec., 1905, *Pittier* 520 (US).

ECUADOR: Cuza, in Andib. sept. Republicae Equator, alt. 2875 m., June, 1876, *Andrè* 3590 (K).

PERU: JUNIN: on sunny brush, La Merced, Hacienda Schunke, alt. about 4000 ft., Aug. 27–Sept. 1, 1923, *Macbride* 5812 (FM).

94. **Mandevilla scaberula** N. E. Br. Trans. Linn. Soc. Bot. II. 6: 48. 1901.

Suffruticose lianas; stems terete, relatively stout, densely puberulent to glabrate; leaves opposite, petiolate, oblong to oblong-elliptic, apex acute to abruptly acuminate, infrequently obtuse, base broadly and rather obscurely cordate, 5–12 cm. long, 2.5–5.0 cm. broad, coriaceous, above scabrous and minutely strigillose, glandular along the midrib, beneath densely tomentulose; petiole 0.3–0.5 cm. long; racemes lateral, somewhat longer than the subtending leaves, bearing 10–30 showy, reddish-yellow flowers; pedicels 0.4–0.6 cm. long; bracts ovate, 0.15–0.3 cm. long, scarious; calyx-lobes ovate-reniform, broadly obtuse or rounded, 0.15–0.2 cm. long, scarious, minutely hispid, the opposite, solitary squamellae trigonal-ligular; corolla typically infundibuliform, minutely puberulent without, the proper-tube slightly gibbous or arcuate, 2.5–3.0 cm. long, about 0.2 cm. in diameter at the base, the throat conical, 1.5–2.0 cm. long, about 1 cm. in diameter at the orifice, below obliquely obovate, 1.5 cm. long, spreading; anthers about 0.5 cm. long, auriculate; ovary ovoid, about 0.15 cm. long, puberulent-papillate; stigma 0.15 cm. long, shortly apiculate; nectaries 5, ovoid, about half as long as the ovary; follicles relatively stout, rather distinctly articulated, 12–15 cm. long, minutely hirtellous; seeds about 0.8 cm. long, the brilliant tawny coma about 1.5 cm. long.

BRITISH GUIANA: Tolimbaru Creek, near Roraima, autumn, 1894, Quelch & McConnell 146 (K, TYPE, MBG, photograph and drawings).

BRAZIL: AMAZONAS: Serra de Mairary, Rio Branco, Febr., 1909, Ule 8449 (B).

95. **Mandevilla bracteata** (HBK.) O. Ktze. Rev. Gen. 2: 414. 1891.

Echites bracteata HBK. Nov. Gen. 3: 217. 1819, not Vell.
Exothostemon bracteatum (HBK.) G. Don, Hist. Dichlam. Pl. 4: 82. 1838.

Mandevilla attenuata Rusby, Descr. So. Am. Pl. 89. 1920.

Suffruticose lianas; stems terete, relatively stout, densely puberulent-tomentulose to glabrate; leaves opposite, petiolate, ovate-lanceolate, apex acuminate, base obscurely cordate, 4–10 cm. long, 1.5–3.5 cm. broad, membranaceous, above puberulent to glabrate, not strigillose, glandular along the midrib, beneath

tomentulose; petioles 0.4–1.0 cm. long; racemes lateral, about as long as the subtending leaves, bearing 10–30 showy, reddish-yellow flowers; pedicels 0.3–0.5 cm. long; bracts ovate to ovate-lanceolate, sessile, 1–3 cm. long, petaloid, usually highly colored, puberulent; calyx-lobes lanceolate, acuminate, 0.6–0.7 cm. long, scarious, puberulent-glabrate, the opposite solitary squamellae trigonal, entire or slightly erose; corolla typically infundibuliform, puberulent without, the proper-tube slightly gibbous or arcuate, particularly before the expansion of the bud, 2–3 cm. long, about 0.15 cm. in diameter at the base, the throat conical, 1.5–2.0 cm. long, about 1 cm. in diameter at the orifice, the lobes obliquely obovate to obovate-oblong, spreading, 1.5–2.5 cm. long; anthers 0.6 cm. long, auriculate; ovary ovoid, about 0.15 cm. long, minutely papillate; stigma 0.2 cm. long, shortly apiculate; nectaries 5, compressed-ovoid, about half as long as the ovary; follicles relatively slender, distantly articulate, densely and minutely puberulent, 10–15 cm. long; seeds about 0.6 cm. long, the brilliant tawny coma about 1.5 cm. long.

COLOMBIA: CAUCA: near the small village of Chisques, Prov. of Popayan, date lacking, *Humboldt & Bonpland* (K, MBG, photograph); VALLE DEL CAUCA: open hillsides east of Dagua, alt. 1200–1500 m., May 13–14, 1922, *Pennell 5604* (NY); near El Carmen, Dagua Valley, Western Cordillera, alt. 1500 m., Dec. 11, 1905, *Pittier 611* (US); ANTIOQUIA: occasional in clearings and on the edge of forest near Las Partidas and Valparaíso, alt. 3500 ft., June 2, 1899, *H. H. Smith 1663* (FM, G, K, MBG, NY, US).

ECUADOR: PICHINCHA: Quito, date lacking, *Karsien s. n.* (V).

96. *Mandevilla hirsuta* (A. Rich.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 171. 1895.

Echites hirsuta A. Rich. Actes Soc. Hist. Nat. Paris 1: 107.

1792, not R. & P.; A. DC. in DC. Prodr. 8: 463. 1844.

Echites tomentosa Vahl, Symb. Bot. 3: 44. 1794; A. DC. loc. cit. 463. 1844.

Echites macrophylla HBK. Nov. Gen. 3: 218. 1819, not Roxb.

Echites campestris Vell. Fl. Flum. 113. 1830; Icon. 3: pl. 43. 1827.

Echites Richardi R. & S. Syst. 4: 391. 1819.

Exostostemon macrophyllum (HBK.) G. Don, Hist. Dichlam. Pl. 4: 82. 1838.

- Echites hispida* Willd. ex R. & S. loc. cit. 795. 1819; A. DC.
loc. cit. 475. 1844.
- Echites auriculata* Pohl, ex Stadelm. Flora 24¹: Beibl. 25.
1841; A. DC. loc. cit. 459. 1844.
- Echites hirsuta* R. & P. α . *latifolia* Stadelm. loc. cit. 27.
1841.
- Echites almadensis* Stadelm. loc. cit. 28. 1841; A. DC. loc.
cit. 464. 1844.
- Echites Stadelmeyeri* Mart. ex Stadelm. loc. cit. 29. 1841;
A. DC. loc. cit. 1844.
- Echites ciliata* Stadelm. loc. cit. 32. 1841; A. DC. loc. cit.
459. 1844.
- Echites Fluminensis* A. DC. loc. cit. 452. 1844.
- Echites Fluminensis* A. DC. β . *Claussenii* A. DC. loc. cit.
1844.
- Echites tomentosa* Vahl β . *laticordata* A. DC. loc. cit. 463.
1844.
- Amblyanthera ciliata* (Stadelm.) Muell.-Arg. in Mart. Fl.
Bras. 6¹: 145. 1860; Miers, Apoc. So. Am. 188. 1878.
- Amblyanthera palustris* Muell.-Arg. loc. cit. 1860.
- Echites palustris* Salzm. ex Muell.-Arg. loc. cit. 146. 1860;
nom. nud. in synon.
- Amblyanthera palustris* Muell.-Arg. β . *almadensis* (Stadelm.)
Muell.-Arg. loc. cit. 1860.
- Amblyanthera hispida* (R. & S.) Muell.-Arg. loc. cit. 147.
t. 44. fig. 2. 1860; Miers, loc. cit. 187. 1878.
- Amblyanthera hispida* (R. & S.) Muell.-Arg. β . *tomentosa*
Muell.-Arg. loc. cit. 148. *t. 44. fig. 3.* 1860.
- Amblyanthera fluminensis* (A. DC.) Muell.-Arg. loc. cit.
1860; Miers, loc. cit. 186. 1878.
- Amblyanthera fluminensis* (A. DC.) Muell.-Arg. β . *Claussenii*
A. DC. ex Muell.-Arg. loc. cit. 149. 1860.
- Amblyanthera fluminensis* (A. DC.) Muell.-Arg. α . *Stadel-
meyeri* (Mart.) Muell.-Arg. loc. cit. 1860.
- Amblyanthera campestris* (Vell.) Muell.-Arg. loc. cit. 149.
1860.
- Rhabdadenia campestris* (Vell.) Miers, loc. cit. 121. 1878.
- Amblyanthera hirsuta* (Vell.) Miers, loc. cit. 185. 1878.

- Amblyanthera Claussenii* (A. DC.) Miers, loc. cit. 187. 1878.
Amblyanthera ovata Miers, loc. cit. 188. 1878.
Temnadenia pallidiflora Miers, loc. cit. 211. 1878, not
 Echites Franciscea Hook. var. *pallidiflora* Hook.
Temnadenia palustris (Salzm.) Miers, loc. cit. 213. 1878.
Temnadenia tomentosa (Vahl) Miers, loc. cit. 1878.
Mandevilla hispida (R. & S.) Hemsl. Biol. Centr.-Am. Bot.
 2: 316. 1882.
Mandevilla palustris (Muell.-Arg.) Hemsl. loc. cit. 317.
 1882.
Mandevilla tomentosa (Vahl) O. Ktze. Rev. Gen. 2: 416.
 1891.
Mandevilla tomentosa (Vahl) O. Ktze. var. *Vahleana* O.
 Ktze. loc. cit. 1891.
Mandevilla tomentosa (Vahl) O. Ktze. var. *hirsuta* (Rich.)
 O. Ktze. loc. cit. 1891.
Mandevilla tomentosa (Vahl) O. Ktze. var. *hispida* (R. & S.)
 O. Ktze. loc. cit. 1891.
Mandevilla fluminensis (A. DC.) Donn. Sm. Enum. Pl.
 Guat. 2: 47. 1891.
Mandevilla auriculata (Stadelm.) K. Sch. loc. cit. 1895.
Mandevilla tomentosa (Vahl) K. Sch. loc. cit. 1895.
Mandevilla Rusbyi Britton, Bull. N. Y. Bot. Gard. 4: 409.
 1907.
Mandevilla denticulata S. F. Blake, Contr. Gray Herb. 52:
 81. 1917.

Suffruticose lianas; stems terete, relatively stout, hispid to glabrate; leaves opposite, petiolate, obovate- to oblong-elliptic, apex rather abruptly acuminate, base obscurely auriculate, 5-20 cm. long, 2-8 cm. broad, membranaceous, above strigillose, glandular along the midrib, beneath minutely tomentulose; petiole 0.1-0.4 cm. long; racemes lateral, equalling or somewhat surpassing the subtending leaves, bearing 5-25 showy, reddish-yellow flowers; pedicels 0.2-0.5 cm. long; bracts ovate to ovate-lanceolate, sessile, 0.5-2.0 cm. long, petaloid; calyx-lobes lanceolate to ovate-lanceolate, 0.5-1.0 cm. long, scarious or somewhat petaloid, hispidulous, the opposite, solitary squamellae trigonal-ligular, entire or somewhat erose; corolla typically infundibuliform.

form, puberulent or pilose without, the proper-tube somewhat gibbous, 2.0–3.5 cm. long, about 0.2 cm. in diameter at the base, the throat conical or conical-campanulate, 1.5–2.0 cm. long, about the same in diameter at the orifice, the lobes obliquely obovate, 1.5–1.75 cm. long, spreading; anthers 0.5 cm. long, auriculate; ovary ovoid, about 0.12 cm. long, glabrous or papillate; stigma 0.2 cm. long, shortly apiculate; nectaries 5, compressed-obovoid, about half as long as the ovary; follicles stout, conspicuously articulated or moniliform, 6–15 cm. long; seeds 0.8 cm. long, the brilliant tawny coma about 1.5 cm. long.

BRITISH HONDURAS: swampy thicket, New Haven, March 8, 1907, Peck 696 (G); Middlesex, secondary forest, alt. 200 ft., Sept. 14, 1929, Schipp 56 (FM, G, NY).

GUATEMALA: ALTA VERAPAZ: Rio Chacate, alt. 1300 pp., April, 1889, J. D. Smith 1746 (US); eastern portions of Vera Paz and Chiquimulas, 1885, Watson 379b (G); Sehachicha, alt. 500 m., March, 1902, Tuerckheim 8244 (B, G, US); vicinity of Secanquin, alt. 550 m., May 20, 1905, Pittier 203 (US); Secanquin, near the Finca Sepacuite, March 29, 1902, Cook & Griggs 273 (US); between Sepacuite and Secoyote, alt. 1100 m., May 24, 1905, Pittier 343 (US); Finca Moeca, alt. 1800 ft., Dec. 4, 1919, Johnson 89 (NY, US); IZABAL: Puerto Barrios, Febr. 25, 1905, Deam 3 (G, NY); May 10–18, 1919, Pittier 8540 (US); in swamp, vicinity of Puerto Barrios, at sea level, June 2–6, 1922, Standley 25027 (G, US).

COSTA RICA: GUANACARTE: bord de la route à Corralillo, May 12, 1890, Pittier 2498 (Bx); PUNTARENAS: broussailles à General, Febr., 1891, Pittier 4002 (Bx, BB, US); buissons de Boruca, Dec., 1891, Pittier s. n. (Bx); SAN JOSE: La Laguna, date lacking, Wercklé 71 (B); LIMON: bord du Rio Amarillo, Santa Clara, alt. 200 m., July 22, 1891, Pittier 13436 (US); Jimenez, Llanuras de Santa Clara, alt. 250 m., Febr., 1896, J. D. Smith 6657 (US); same locality, April, 1894, J. D. Smith 4884 (B, BM, G, K, US); DATA INCOMPLETE: Aug., 1875, Endres 235 (K).

NICARAGUA: CHONTALES: in the vicinity of San Juan del Norte (Greytown), Jan., 1896, C. L. Smith 71 (US); DATA INCOMPLETE: 1867, Tate 235 (BM, K).

PANAMA: COLON: between France Field, C. Z., and Catival, Jan. 9, 1924, Standley 30385 (US); Santa Rita Trail, Febr. 27, 1905, Cowell 134 (NY); CHIRIQUI: vicinity of San Felix, alt. 0–120 m., Jan., 1912, Pittier 5460 (US); COCLE: above Penonomé, March 5–10, 1908, Williams 547 (NY); BOCAS DEL TORO: lower Changuinola River, July–Aug., 1923, Stork 270 (US); PANAMA: vicinity of La Palma, southern Darien, alt. 0–50 m., Jan.–Febr., 1912, Pittier 5490 (US); in a wet ravine, near Panama, out on the railroad, May 13, 1862, Hayes s. n. (BM); CANAL ZONE: between Chagres Batteries and Fort San Lorenzo, Fort Sherman Military Reservation, June 14, 1923, Mazon & Valentine 6972 (US); mouth of the Rio Chagres, near Old Fort Lorenzo, March 8, 1923, Piper 5914 (US); Gatun Sta., Oct., 1859, Hayes 167 (NY); same locality, Oct. 28, 1859, Hayes 98 (G); near Fort Randolph, May 26, 1923, Mazon & Harvey 6527 (US).

COLOMBIA: VALLE DEL CAUCA: cliffs along Rio Dagua, alt. 80–100 m., near Cordoba, Oct. 9, 1922, Killip 11775 (NY); Cordoba, Dagua Valley, Pacific Coastal Zone, alt. 30–100 m., Dec., 1905, Pittier 555 (US); SANTANDER DEL NORTE: Ocafia to Pamplona, open spaces, alt. 3000 ft., Dec. 18, 1876, Kalbreyer 837 (B, K); DEPARTMENT UNKNOWN: Lusumucu, alt. 1165 m., Jan. 12, 1876, André 1942 (K).

VENEZUELA: data incomplete, 1868, *Stevens s. n.* (NY).

TRINIDAD: forest border, Aripo Savanna, March 5, 1920, *Britton, Broadway & Hazen* 310 (G, NY, US); Brighton, June 17, 1903, *Johnston* 92 (G, NY); forest, Brazil, March 6, 1921, *Britton Britton & Freeman* 2135 (G, NY, US); Aripo road via Arima, near 3 Mile Post, climbing over shrubs, Oct. 16, 1925, *Broadway s. n.* (K, MBG); Santa Cruz, roadside leading to Providence Estate, May 20, 1908, *Broadway* 2592 (B, FM); Cakaden, April, 1874, *Kuntze* 856 (NY); Aripo Savannah, April 26, 1924, *Broadway s. n.* (FM); Spring Hill, near Scarborough, Jan. 11, 1910, *Broadway* 3375 (B, MBG); Tobago, Oct., 1889, *Eggers* 5546 (B, C, K, US); in fruticosis ad Arima, Dec., 1883, *Eggers* 1155 (B, K, US, V); Port-of-Spain, Aug. 2, 1899, *Preuss* 1462 (B); King's Bay, March 22, 1896, *Seitz* 14 (B); Tobago, date lacking, *Hamilton s. n.* (DL); exact locality lacking, April 4, 1874, *Kuntze* 601 (FM, NY); exact locality and date lacking, *Sieber* 333 (DC, DL, MBG, V); data incomplete: 1877-80, *Fendler* 624 (K); Sept. 14, 1842, *Crueger s. n.* (K).

BRITISH GUIANA: Kamakusa, upper Mazuruni River, longitude about $59^{\circ} 50' W.$, July 11-22, 1923, *Cruz* 4154 (FM, MBG, PA, US); Pomeroon River, Pomeroon District, Dec. 17-24, 1922, *Cruz* 5100 (FM, G); Morawhanna, Barima River, Jan. 14, 1920, *Hitchcock* 17500 (G, NY, US); East Coast Water Conservancy, southeast of Georgetown; canal southeast of Lamaha Stop-off, Nov. 27, 1919, *Hitchcock* 16972 (G); Bartica, on the Essequibo River, Nov., 1888, *Jenman* 4726 (BM, K, NY); vicinity of Bartica, on the Essequibo River, Sept. 3-12, 1922, *Cruz* 1990 (FM, MBG, NY, US); Essequibo River, Sept.-Oct., year lacking, *Jenman* 1313 (K); Courantyne River, Oct., 1879, *im Thurn s. n.* (K); above Barakara, Dec. 26, 1914, *Hohenkerk* 680 (K); Epruo, Courantyne River, Oct., 1879, *Jenman* 447 (K); Lamaha, April, 1887, *Jenman* 3867 (K); Pomeroon River, Sept., 1904, *Bartlett* 8007 (B); data incomplete: *Parker s. n.* (K); *Schomburgk* 130 (B).

DUTCH GUIANA: ad aquas prope urbem Paramaribo, March-April, 1844, *Kappler* 1605 (BB, MBG, S); Mosquitokuste, date lacking, *Wullsclagel s. n.* (V); Republick, savanne, Oct. 13, 1911, *Kuyper* 39 (B); Paramaribo, date lacking, *Wullsclagel* 320 (V); in umbrosis prope Paramaribo, Dec., 1837, *Splitgerber s. n.* (V); data incomplete, *Hostmann* 946 (K, NY, U).

FRENCH GUIANA: vicinity of Cayenne, July 14, 1921, *Broadway* 826 (US); Cayenne 1835, *le Prieur s. n.* (K); Karouany, 1836, *Sagot* 381 (BB, BM, K, S, V); Cayenne, 1819, *Perrottet* 272 (DL); Cayenne, 1835, *le Prieur s. n.* (DL); data incomplete: July, 1824, *Poiteau s. n.* (K); 1792, *le Blond* 387 (DL); 1819-21, *Poiteau s. n.* (DL); *le Prieur* 244 (DL); 1802, *Gabriel s. n.* (DL).

BRAZIL: PARA: at Para, in a walk between S. Jose and the arsenal, 20 Aug., 1829, *Burchell* 9550 (K); at the village of Sta. Anna, 7 June, 1829, *Burchell* 9356 (K); Para, 1916, *Moss s. n.* (BM); vicinity of Para, Jan., 1908, *Baker* 165 (BM); thickets, Para, Oct. 27-Nov. 7, 1929, *Baker* 165 (BM); thickets, Para, Oct. 27-Nov. 7, 1929, *Killip & Smith* 30257 (MBG, US); in open field on low land, Campo de Boa Esperanca, Maracassume River region, Sept. 1, 1932, *Krukoff* 1854 (MBG, NY); in thickets, near Para, July, 1849, *Spruce* 229 (K); SÃO PAULO: level sandy soil covered with Capoeiro and forest, in a walk from the outeirinhos to the town (Santos), Oct. 18, 1826, *Burchell* 3255 (Bx, NY); S. Vicente, Nov. 18, 1898, *Loefgren* 1141 (B); MARANHÃO: Cururupu, Aug. 1914, *Lisboa* 4786 (B); MINAS GERAES: Jan. 21, 1861, *Regnell* 189 (B, K, S, US); 1841, *Claussen* 1969 (NY); Aug.-April, 1840, *Claussen* 250 (Bx, K, S); Caxoeira, date lacking, *Claussen* 190 (Bx, DL); Congonhas do Campo, 1893, *Stephan s. n.* (Bx); 1875, *Widgren* 61 (Bx, S); Bello Horizonte, Dec. 15, 1918, *Hoehne*

3185 (B); in campo, Nov. 24, 1905, Sampaio 238 (B); Caete, Nov., 1915, Hoehne 6633 (B); RIO DE JANEIRO: near Rio de Janeiro, date lacking, Glaziou 8796 (Bx, K, US); Rio de Janeiro, 1878-79, Glaziou 11195 (B, K); Rio de Janeiro, Nov., 1897, Ule 4580 (B); Rio de Janeiro, date lacking, Sello 170 (B); near Mage, on the flat between the head of the bay of Rio and the Organ Mts., March, 1837, Gardner 535 (K); Mage, March, 1838, Miers 4022 (BM); Mage to Frechal, Jan. 15, 1838, Miers 4031 (BM); PERNAMBUCO: roadside between Pernambuco and Catuca, date lacking, Gardner 1961 (K); July, 1887, Ridley Lea & Ramage s. n. (BM, K); AMAZONAS: Roraima, alt. 1200 m., Febr., 1910, Ule s. n. (B); bei S. Marcos, Rio Branco, Jan. 1909, Ule 7823 (B) Boa Vista, Rio Branco super, ad marginem silvae, July, 1913, Kuhmann 3651 (B, US); GOIAS: between Riacho and Catalao, 23 Sept. 1827, Burchell 5946 (Bx, K); civit. Goyaz, 1894-95, Glaziou 21718 (B); BAHIA: St. Thoma, int. Jacobina et Villanova, 1845, Blanchet 3797 (BM); MATTO GROSSO: Serra de Cujaba, date lacking, Manso & Lhotzky 2 (B); June 11, 1899, Pilger 670 (B); ad villam Cujabam, date lacking, Manso & Lhotzky 29 (B, DC); Cujaba, in silvula, loco subhumido, Dec. 5, 1893, Malme 1198 (B); DATA INCOMPLETE: 1842, Blanchet 3636 (BM); 1859, Sello 217 (K, NY); Riedel, s. n. (B, BB, G); Blanchet 1387 (BM); Sello 998 (B).

BOLIVIA: LA PAZ: Yungas, alt. 6000 ft., 1885, Rusby 2387 (FM, NY); Polo-Polo, bei Coroico, Nord-Yungas, Oct.-Nov. 1912, Buchtien 4673 (US); SANTA CRUZ: bosque virgen, Rio Vibora, Prov. Tchilo, alt. 350 m., June 10, 1926, Steinbach 7577 (S); DATA INCOMPLETE: Bang 2843 (B, FM, K, MBC, NY, US); Miers 98 (BM).

M. hirsuta has the distinction of being perhaps the most widespread, frequent, uniform, and also the most complex bibliographically of the species of *Mandevilla*. After a study of a wealth of herbarium material, much of which is cited above, it is hard to understand how the species could successfully be subdivided, since all evident characteristics, such as floral and foliar structure, pubescence, etc., are unusually uniform for a species of such a wide geographical distribution. The complex synonymy can undoubtedly be ascribed largely to the meagre specimens and poor bibliographical aids of the earlier authors and the changing generic concepts of their successors.

Passing reference should be made to *Echites campestris* Vell., provisionally assigned to synonymy under *M. hirsuta*. Velloso's species contains no characteristics, either in the rather inadequate plate or in the equally inadequate description, which distinguish it effectively from *M. hirsuta* except that it is reported as bearing solitary axillary flowers. The plate in the 'Flora Fluminensis,' however, shows that the flowers are immediately subtended by several foliaceous or petalaceous bracts. The outline and indument of the leaves also support such a disposition of the species.

97. *Mandevilla sagittarii* Woodson, Ann. Mo. Bot. Gard. 19: 72. 1932.

Suffruticose lianas; stems terete, relatively stout, ferruginous-hispidulous to glabrate; leaves opposite, petiolate, broadly oblong- to obovate-elliptic, apex abruptly subcaudate-acuminate, 4-6 cm. broad, firmly membranaceous, above sparsely strigillose, glandular along the midrib, beneath densely tomentulose; petiole 1.0-1.5 cm. long; racemes lateral, about half as long as the subtending leaves, bearing 5-15 showy, reddish-yellow flowers; pedicels 0.7-0.8 cm. long; bracts ovate, caudate-acuminate, sessile, 1.0-1.5 cm. long, petaloid; calyx-lobes linear-lanceolate, 0.7-0.8 cm. long, slightly petaloid, sparsely and minutely pilosulose, the opposite, solitary squamellae deltoid, indistinctly erose; corolla typically infundibuliform, pilosulose without, the proper tube indistinctly gibbous, 2.5 cm. long, about 0.2 cm. in diameter at the base, the throat broadly tubular, 3 cm. long, about 0.75 cm. in diameter at the orifice, the lobes obliquely obovate, 1.5 cm. long, spreading; anthers 0.3-0.4 cm. long, auriculate; ovary ovoid, about 0.2 cm. long, glabrous or minutely papillate; stigma 0.15 cm. long, shortly apiculate; nectaries 5, compressed-ovoid, about half as long as the ovary; follicles relatively slender, obscurely moniliform, 12-15 cm. long, hispidulous; seeds 1 cm. long, the brilliant tawny coma about 2 cm. long.

COLOMBIA: CHOCO: between La Oveja and Quibdo, April 1-2, 1931, *Archer* 1714 (US, TYPE, MBG, photograph and analytical drawings).

98. *Mandevilla Moritziana* (Muell.-Arg.) Donn. Sm. Enum. Pl. Guat. 3: 50. 1893, as to name-bringing synonym, not as to specimens cited.

Amblyanthera Moritziana Muell.-Arg. Linnaea 30: 421. 1860; Miers, Apoc. So. Am. 189. 1878.

Suffruticose lianas; stems relatively slender, rather sparsely ferruginous-hirtellous to glabrate; leaves opposite, petiolate, ovate to ovate-lanceolate, apex acute to acuminate, base obscurely auriculate, 8-14 cm. long, 3-8 cm. broad, membranaceous, above sparsely and minutely strigillose to glabrate, glandular along the midrib, beneath sparsely hirtellous to glabrate; petioles 1.0-1.5 cm. long; racemes lateral, usually somewhat shorter than the

subtending leaves, bearing 15–30 pale yellowish flowers; pedicels 0.5–1.0 cm. long; bracts oblanceolate or spatulate, clawed, 1–2 cm. long, petaloid; calyx-lobes ovate-lanceolate, acuminate, 0.2–0.3 cm. long, scarious, the opposite, solitary squamellae trigonal-ligular, entire or slightly erose; corolla typically infundibuliform, glabrous without, the proper-tube distinctly gibbous, 1.5–2.0 cm. long, about 0.2 cm. in diameter at the base, the throat conical-campanulate, 1.5 cm. long, about 1 cm. in diameter at the orifice, the lobes obliquely obovate, 1 cm. long, spreading; anthers 0.3 cm. long, obscurely auriculate; ovary ovoid-oblongoid, about 0.15 cm. long, glabrous; stigma 0.15 cm. long, shortly apiculate; nectaries 5, compressed-ovoid, about half as long as the ovary; follicles relatively slender, conspicuously articulated, 20–25 cm. long, glabrous or very sparsely and minutely hirtellous; seeds about 1.25 cm. long, the brilliant tawny coma about 2.5 cm. long.

VENEZUELA: MERIDA: a few miles s. e. of Colonia Tovar, alt. 4000 ft., Febr. 27, 1857, Fendler 2382 (G); ARAGUA: El Portachuelo, between Maracay and Acumare de la Costa, Jan. 29, 1922, Pittier 10127 (US); DISTRITO FEDERAL: Caracas, date and collector unknown (S); DATA INCOMPLETE: Moritz 31 (BB, TYPE, MBG, photograph and analytical drawings).

The specimens assigned to this species by Capt. Smith are all plants of Guatemala properly referable to *M. villosa* (Miers) Woodson. Nevertheless, the authorship of the combination must remain as cited in the preceding paragraphs, as such a change in nomenclature is purely mechanical, and incorrect assignment of specimens at the time of the change, although embarrassing, should not affect its validity.

99. *Mandevilla polyantha* K. Sch. ex Woodson, Ann. Mo. Bot. Gard. 19: 73. 1932.

Mandevilla polyantha K. Sch. in Engl. Bot. Jahrb. 40: 403. 1908, nom. nud.

Suffruticose lianas; stems terete, relatively slender, pilose or pilosulose to glabrate; leaves opposite, petiolate, broadly elliptic to obovate-elliptic, apex acuminate, base rather narrowly and obscurely cordate, 7–12 cm. long, 3–6 cm. broad, membranaceous, above sparsely pilosulose and glandular along the midrib, beneath laxly puberulent, particularly along the veins and midrib;

petioles 1.0–1.5 cm. long; racemes lateral, about twice as long as the subtending leaves, bearing 20–35 greenish-white or yellowish flowers; pedicels secund, 1 cm. long, conspicuously accrescent after maturity; bracts minutely linear, scarious; calyx-lobes broadly trigonal, acute, 0.1 cm. long, scarious, densely puberulent-papillate, the opposite solitary squamellae deltoid, denticulate; corolla typically infundibuliform, glabrous without, the proper-tube conspicuously gibbous, more or less ventricose, 1.0–1.25 cm. long, about 0.15 cm. in diameter at the base, the throat conical, about 1 cm. long, 0.5 cm. in diameter at the orifice, the lobes obliquely obovate-reniform, 0.25 cm. long, widely spreading; anthers 0.3 cm. long, rather obscurely auriculate; ovary ovoid-oblongoid, about 0.15 cm. long, glabrous; stigma 0.1 cm. long, shortly apiculate; nectaries 5, compressed-ovoid, scarcely as long as the ovary; mature follicles unknown.

PERU: LORETO: Yurimaguas, lower Rio Huallaga, alt. 135 m., woods, Aug. 22–Sept. 9, 1929, Killip & Smith 27579 (MBG, US); Yurimaguas, Aug., 1902, Ule 6271 (B, TYPE, MBG, photograph and analytical drawings).

100. *Mandevilla caurensis* Mg. Notizblatt 9: 87. 1924.

Erect, ascending, or clambering, suffruticose undershrubs; stems distinctly alate, relatively stout, glabrous; leaves opposite, petiolate, oblong-elliptic, apex shortly acuminate, base cuneate-rounded, 10–12 cm. long, 4.0–4.5 cm. broad, firmly chartaceous, glabrous, glandular along the midrib above; petioles 1.0–1.5 cm. long; racemes simple, terminal; pedicels 0.1–0.15 cm. long; bracts scarious, 0.1 cm. long; calyx-lobes ovate-trigonal, acute, 0.1 cm. long, scarious, glabrous, the solitary opposite squamellae lacerate; corolla infundibuliform, glabrous without, the proper-tube somewhat gibbous or arcuate, 2.5 cm. long, about 0.3–0.4 cm. in diameter at the base, the throat somewhat narrowly conical, 3 cm. long, about 0.5 cm. in diameter, the lobes obliquely obovate, 2.5 cm. long, widely spreading; anthers truncate, 0.7 cm. long; stigma very shortly apiculate; nectaries 5, compressed-ovoid, about half as long as the ovary; ovary ovoid, about 0.2 cm. long, glabrous; follicles unknown.

VEZUELA: BOLIVAR: Cuchivero, Febr. 22, 1902, Selwyn 801 (B); Caura-Gebiet am oberen Orinoco, Bergwälder bei Santa Lucia, Dec. 7, 1901, Passarge 86 (B, TYPE, MBG, photograph and analytical drawings).

101. *Mandevilla Vanheurckii* (Muell.-Arg.) Mgf. Notizblatt 9: 87. fig. 2L. 1924.

Heterothrix Vanheurckii Muell.-Arg. in Van Heurck, Bot. Obs. 164. 1871.

Eriadenia obovata Miers, Apoc. So. Am. 117. 1878.

Heterothrix Van Heurckii Müll. ex Miers, loc. cit. 264. 1878, sphalm.

Mandevilla glabra N. E. Br. Trans. Linn. Soc. Bot. II. 6: 47. 1906.

Erect, ascending, or clambering, suffruticose undershrubs; stems irregularly alate, relatively stout, glabrous; leaves opposite, petiolate, elliptic to obovate-lanceolate, apex acute to obtuse, cuspidate or somewhat subcaudate, occasionally rounded, base acute to attenuate, 5–8 cm. long, 1.5–3.0 cm. broad, coriaceous, glabrous, glandular along the midrib above; racemes lateral or subterminal, commonly somewhat longer than the subtending leaves, bearing 3–15 yellowish flowers; pedicels 0.2–0.3 cm. long; bracts ovate, about 0.1 cm. long, scarious; calyx-lobes ovate, acute, 0.1–0.2 cm. long, scarious, puberulent-papillate, the opposite solitary squamellae deeply lacerate; corolla infundibuliform, glabrous without, the proper-tube somewhat gibbous, 2–3 cm. long, about 0.15 cm. in diameter at the base, throat shortly conical, 1.5–2.0 cm. long, about 1 cm. in diameter at the orifice, the lobes obliquely obovate, 1 cm. long, widely spreading; anthers obscurely auriculate, 0.6–0.7 cm. long; ovary ovoid, about 0.2 cm. long, minutely puberulent-papillate; stigma 0.2 cm. long, shortly apiculate; nectaries 5, compressed-obovoid, about one-third as long as the ovary; follicles relatively slender, slightly articulated, 10–15 cm. long, glabrous; seeds about 0.6 cm. long, the tawny coma about 1.5 cm. long.

PERU: LORETO: prope Tarapoto, 1855–56, Spruce 4303 (Camb., K, V, MBG, photograph and analytical drawings); Berge östlich von Moyobamba, in einer Übergangsformation zwischen Savannen- und Hartlaubgestrauch, alt. 1300–1400 m., Sept. 18, 1904, Weberbauer 4740 (B, MBG, photograph and analytical drawings).

102. *Mandevilla Ulei* Mgf. Notizblatt 9: 86. fig. 2M. 1924.

Erect or ascending, suffruticose undershrubs; stems inconspicuously alate, relatively stout, minutely puberulent when young, eventually becoming glabrate; leaves opposite, petiolate, obovate-

oblong, apex abruptly and shortly acuminate, base shortly angustate, 10–12 cm. long, 5–6 cm. broad, coriaceous, glabrous, glandular along the midrib above; petioles 1.0–1.5 cm. long; racemes somewhat shorter than the subtending leaves, simple, bearing 10–15 deep yellowish flowers; pedicels about 0.1 cm. long; bracts minutely ovate-trigonal, scarious; calyx-lobes ovate-trigonal, acute, about 0.25 cm. long, puberulent-papillate without, the opposite solitary squamellae somewhat erose; corolla infundibuliform, minutely puberulent-papillate without, the proper-tube somewhat gibbous or arcuate, about 3 cm. long, about 0.3 cm. in diameter at the base, the throat about 3 cm. long, about 3 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, about 2 cm. long, widely spreading; anthers very obscurely auriculate, 0.7 cm. long; ovary ovoid-oblongoid, about 0.2 cm. long, minutely puberulent; stigma 0.3 cm. long, long-apiculate; nectaries 5, compressed-oblongoid, concrescent at the base, about $\frac{1}{3}$ as long as the ovary; mature follicles unknown.

BRAZIL: AMAZONAS: Manños, am Waldrand bei Flores, July 31, 1900, Ule 5176 (B, TYPE).

103. *Mandevilla subcarnosa* (Benth.) Woodson, in Gleason, Bull. Torrey Bot. Club 58: 453. 1931.

Echites subcarnosa Benth. in Hook. Jour. Bot. 3: 247. 1841.
Mesechites subcarnosa (Benth.) Miers, Apoc. So. Am. 231. 1878.

Mandevilla subcarnosa Benth. & Hook. ex Miers, loc. cit. 1878, sphalm in synon.

Mandevilla Dielsiana Mgf. Notizblatt 9: 86. 1924.

Erect, ascending or clambering, suffruticose undershrubs; stems irregularly compressed or alate, relatively stout, glabrous; leaves opposite, petiolate, broadly oblong-elliptic, apex obtuse to rounded, base rounded or very obscurely cordate, 4.5–8.0 cm. long, 2.0 cm. broad, coriaceous, glabrous, glandular along the midrib above; petioles 0.4–0.5 cm. long; racemes terminal to subterminal, commonly somewhat exceeding the length of the subtending leaves, bearing 10–30 yellowish flowers; pedicels 0.4–0.6 cm. long; bracts minutely ovate, scarious; calyx-lobes

ovate, acute, about 0.1 cm. long, scarious, minutely papillate, the opposite solitary squamellae deeply lacerate; corolla infundibuliform, glabrous without, the proper-tube inconspicuously gibbous, 2.0–2.5 cm. long, about 0.15 cm. in diameter at the base, the throat campanulate, 1.0–1.5 cm. long, about 1.5 cm. in diameter at the orifice, the lobes obliquely obovate, 0.5 cm. long, spreading; anthers obscurely auriculate, 0.7 cm. long; ovary ovoid, about 0.15 cm. long, puberulent-papillate; stigma 0.3 cm. long, shortly apiculate; nectaries 5, compressed-obovoid, about $\frac{1}{3}$ as long as the ovary; follicles relatively stout, slightly articulated, 8–12 cm. long, glabrous; seeds about 0.6 cm. long, the brilliant tawny coma about 1.5 cm. long.

VENEZUELA: AMAZONAS: in der Restinga bei Schaweila Mota, Rio Cuquenan, Dec., 1909, Ule 8737 (B, MBG, photograph and analytical drawings); rocky top of Esmeralda Ridge, alt. about 325 ft., Oct. 6, 1928, Tate 188 (MBG, NY).

BRITISH GUIANA: Roraima, date lacking, Schomburgk 183 (K, TYPE, MBG, photograph and analytical drawings).

104. *Mandevilla lancifolia* Woodson, Ann. Mo. Bot. Gard. 19: 74. 1932.

Erect or ascending, suffruticose undershrubs; stems compressed or more or less alate, relatively slender, densely puberulent-papillate when young, eventually glabrate; leaves opposite, very shortly petiolate, linear-lanceolate, 3–6 cm. long, 0.5–0.7 cm. broad, firmly membranaceous, glabrous, inconspicuously glandular along the midrib above; petioles 0.1–0.3 cm. long; racemes lateral to subterminal, about twice as long as the subtending leaves, bearing 1–7 yellowish flowers; pedicels 0.15 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate, acute, 0.15–0.2 cm. long, scarious, glabrous or minutely papillate, the opposite, solitary squamellae profoundly lacerate; corolla infundibuliform, glabrous without, the proper-tube very inconspicuously gibbous, 1 cm. long, about 0.1 cm. in diameter at the base; the throat tubular-conical, 1.5–2.0 cm. long, about 0.5 cm. in diameter at the orifice, the lobes obliquely obovate, 1.5–2.0 cm. long, spreading; anthers obscurely auriculate, 0.6 cm. long; ovary narrowly oblongoid, about 0.2 cm. long, glabrous; stigma 0.2 cm. long, very shortly apiculate; nectaries 5, compressed-obovoid, about $\frac{1}{4}$ as long as the ovary; follicles slender, obscurely

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articulated, 7–10 cm. long, glabrous; seeds 0.5 cm. long, the brilliant coma 1.5 cm. long.

VENEZUELA: AMAZONAS: prope Maypures, ad flumen Orinoco, June, 1854, Spruce 3810 (K, V, MBG, photograph and analytical drawings); Puerto Ayacucho, alt. 100 m., May, 1931, Holt & Blake 819 (MBG, TYPE, US).

105. Mandevilla anceps Woodson, Ann. Mo. Bot. Gard. 19: 75. 1932.

Erect or ascending, suffruticose undershrubs; stems conspicuously alate, relatively stout, minutely puberulent when young, eventually glabrate; leaves opposite, shortly petiolate, broadly elliptic-oblong, apex acute to abruptly acuminate, base obsoletely cordate, 5–8 cm. long, 2–3 cm. broad, subcoriaceous, above minutely puberulent-papillate, inconspicuously glandular along the midrib, beneath densely puberulent; petioles 0.5 cm. long; racemes lateral or subterminal, shorter than the subtending leaves, bearing 3–5 yellowish flowers; pedicels 0.2–0.3 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate-lanceolate, acuminate, 0.15 cm. long, scarious, minutely puberulent-papillate, the opposite, solitary squamellae deltoid, lacerate; corolla infundibuliform, minutely puberulent-papillate without, the proper-tube very inconspicuously gibbose, 2.5–3.0 cm. long, about 0.1 cm. in diameter at the base, the throat conical, 2 cm. long, about 1 cm. in diameter at the orifice, the lobes obliquely obovate-reniform, 1.5 cm. long, widely spreading; anthers auriculate, 0.5 cm. long; ovary ovoid-oblongoid, about 0.1 cm. long, densely puberulent-papillate; stigma 0.15 cm. long, obscurely apiculate; nectaries 5, compressed-oblongoid, scarcely as long as the ovary; follicles slender, somewhat articulated, 9 cm. long, minutely puberulent; seeds 0.5 cm. long, the tawny coma 1.5 cm. long.

BRAZIL: AMAZONAS: "in monte. Tarurumari fluvii Pacimoni," Febr. 1854, Spruce 3395 (K, TYPE, MBG, photograph and analytical drawings).

106. Mandevilla Benthamii (A. DC.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 171. 1895.

Echites angustifolia Benth. in Hook. Jour. Bot. 3: 247. 1841, not Poir.

Echites Benthamii A. DC. in DC. Prodr. 8: 467. 1844.

Amblyanthera Benthamii (A. DC.) Muell.-Arg. Linnaea 30: 451. 1860.

Mesechites angustata Miers, Apoc. So. Am. 231. 1878.

Erect or ascending, suffrutescent undershrubs; stems irregularly compressed or alate, relatively stout, minutely puberulent when young, eventually glabrate; leaves verticillate, commonly ternate or quaternate, crowded, sessile or subsessile, linear-lanceolate, 1.5–4.0 cm. long, 0.2–0.4 cm. broad, coriaceous, glabrous, above inconspicuously glandular along the midrib; racemes terminal or subterminal, rarely lateral, conspicuously longer than the subtending leaves, bearing 5–30 congested, yellowish flowers; pedicels 0.1–0.2 cm. long; bracts minutely ovate, scarious; calyx-lobes ovate, acute, about 0.1 cm. long, scarious, glabrous, the opposite, solitary squamellae deeply lacerate; corolla infundibuliform, glabrous without, the proper-tube gibbous, 1.0–1.25 cm. long, about 0.1 cm. long, the throat conical, 1.0–1.5 cm. long, about 0.75 cm. in diameter at the orifice, the lobes obliquely obovate, 1 cm. long, widely spreading; anthers obscurely auriculate, 0.5–0.6 cm. long; ovary ovoid, about 0.2 cm. long, glabrous; stigma about 1.5 cm. long, shortly apiculate; nectaries 5, compressed-obovoid, about half as long as the ovary; follicles relatively slender, continuous or slightly articulated, 8–12 cm. long, glabrous; seeds 0.5 cm. long, the brilliant tawny coma 2 cm. long.

BRITISH GUIANA: Kaieteur Savannah, Potaro River, Sept.–Oct., 1881, *Jenman* 1224 (K, MBG, photograph and analytical drawings); Cako Creek, June, 1864, *Appan* 1914 (K); among underwood in the sandstone region of Roraima, 1840, *Schomburgk* 1953 (K, TYPE); Kaieteur Savannah, about the commonest of the low plants on this savannah, Febr. 24, 1879, *in Thurn* (K); Kaieteur Plateau, Potaro River, alt. 1300 ft., May, 1926, *Loz* 543 (K).

107. *Mandevilla javitensis* (HBK.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 171. 1895.

Echites javitensis HBK. Nov. Gen. 3: 220. 1819; A. DC. in DC. Prodr. 8: 461. 1844.

Exothostemon Javitense (HBK.) G. Don, Hist. Dichlam. Pl. 4: 82. 1838; Miers, Apoc. So. Am. 239. 1878.

Erect or ascending undershrubs; stems compressed, relatively stout, glabrous; leaves opposite, oblong-elliptic, apex abruptly and shortly acuminate, base obtuse or rounded, 10–12 cm. long, 4–5 cm. broad, coriaceous, glabrous, or very minutely papillate beneath, glandular along the midrib above; petioles 1.0–1.5 cm.

long; racemes somewhat longer than the subtending leaves, terminal, simple; pedicels about 0.1–0.2 cm. long; bracts 2.5–4.0 cm. long, oblong-obovate, obtuse to rounded, flat, somewhat petalaceous, deciduous; calyx-lobes ovate-trigonal, broadly acute to obtuse, 0.2 cm. long, glabrous or slightly ciliolate, the opposite, solitary squamellae somewhat erose or lacerate; corolla infundibuliform, glabrous without, the proper-tube somewhat gibbous or arcuate, 2.5–3.0 cm. long, about 0.3 cm. in diameter at the base, the throat broadly conical, 2.0–2.5 cm. long, about 2 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2 cm. long, widely spreading; anthers obscurely auriculate, 0.7 cm. long; ovary ovoid, about 0.2 cm. long, glabrous; stigma 0.3 cm. long, shortly apiculate; nectaries compressed-obvoid, about half as long as the ovary; mature follicles unknown.

VENEZUELA: AMAZONAS: ad ripam obumbratum fluminis Temi, prope Javita, date lacking, *Humboldt & Bonpland s. n.* (TYPE).

BRAZIL: AMAZONAS: Cachoeira, sandy ground recently cleared, 1898, *Gwynne-Vaughn 31* (K, MBG, photograph).

108. *Mandevilla Spruceana* (Muell.-Arg.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 171. 1895.

Amblyanthera Spruceana Muell.-Arg. in Mart. Fl. Bras. 6¹: 143. 1860; Miers, Apoc. So. Am. 190. 1878.

Erect or ascending, suffruticose undershrubs; stems compressed, relatively stout, minutely puberulent when young, eventually becoming glabrate; leaves opposite, petiolate, oblong-elliptic, apex abruptly and shortly acuminate, base obtuse, 7–9 cm. long, 2.5–4.0 cm. broad, coriaceous, glabrous, or minutely puberulent-papillate beneath, glandular along the midrib above; petioles 1.0–1.5 cm. long; racemes somewhat shorter than the subtending leaves, terminal, simple, bearing 10–25 showy, cream-colored flowers; pedicels about 0.1 cm. long; bracts oblong-lanceolate, subcaudate-acuminate, 0.2–0.3 cm. long, petalaceous, more or less navicular or carinate; calyx-lobes ovate-trigonal, broadly acute to obtuse, 0.4 cm. long, glabrous, scarious, the opposite, solitary squamellae deeply lacerate; corolla infundibuliform, glabrous without, or minutely papillate when immature, the proper-tube slightly gibbous or arcuate, 2.0–2.5 cm. long, about

0.25 cm. in diameter at the base, the throat conical-campanulate, 1.5–2.0 cm. long, about 1.5 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 2.0–2.5 cm. long, widely spreading; anthers obscurely auriculate, 0.7 cm. long; ovary ovoid, about 0.2 cm. long, glabrous or minutely papillate; stigma 0.2 cm. long, shortly apiculate; nectaries 5, compressed-oblongoid, more or less concrescent, about half as long as the ovary; follicles unknown.

BRAZIL: AMAZONAS: San Carlos, in sylv. humilior. April, 1854, Spruce s. n. (K, MBG, photograph); prope Panure ad Rio Ushupes, Oct. 1852-Jan., 1853, Spruce 2863 (Camb., V, ISOTYPE).

EXCLUDED SPECIES

Mandevilla potosina Brandg. Univ. Calif. Publ. Bot. 4: 276. 1912 = *Fernaldia pandurata* (A. DC.) Woodson, Ann. Mo. Bot. Gard. 19: 48. 1932.

Mandevilla velutina K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 171. 1895 = *Fernaldia pandurata* (A. DC.) Woodson, loc. cit. 1932.

IV. MACROSIPHONIA Muell.-Arg.

Macrosiphonia Muell.-Arg. in Mart. Fl. Bras. 6¹: 137. 1860; Benth. & Hook. Gen. Pl. 2: 726. 1876; Miers, Apoc. So. Am. 129. 1878; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 166. 1895.

Echites of early authors, in part, not P. Br.

Lactescent, suffrutescent herbs or undershrubs. Stems erect or ascending, frequently more or less decumbent, terete; branches opposite below, becoming alternate above. Leaves opposite or verticillate, shortly petiolate to sessile, the blade firmly membranaceous to coriaceous, entire or more or less undulate-crisped, pinnerved, glandular at the base of the midrib above. Inflorescence terminal, subterminal, or lateral, racemose, reduced to 1–2 flowers in certain species, always few-flowered, the pedicels subtended by one to several bracts. Flowers white or cream-colored, frequently suffused with pink, drying brownish-orange, nyctanthous or vespertine. Calyx 5-parted, the lobes subequal, imbricated, cleft nearly to the receptacle, bearing within many uniformly distributed, glandular squamellae. Corolla infundi-

buliform, the proper-tube narrowly cylindrical, straight, abruptly dilated at the insertion of the stamens into the conical or campanulate throat, the limb 5-parted, actinomorphic, dextrorsely convolute. Stamens 5, included; anthers connivent and directly agglutinated to the stigma, consisting of 2 parallel, uniformly fertile sporangia borne ventrally near the apex of an enlarged, sagittate, obtusely 2-auriculate, peltate connective; pollen granular; filament very short, subcylindrical, pilose. Carpels 2, united at the apex by an elongate, stylar shaft surmounted by the pentagonal-subglochidiate stigma; ovules many, several-seriate, anatropous, borne upon an axile, binate placenta. Nectaries 5, separate or somewhat concrescent at the base. Follicles apocarpous, terete, continuous or articulated, dehiscing along the ventral suture, containing many dry, subscaphiform, truncate, apically comose seeds.

Type species: *Macrosiphonia Velame* (St. Hil.) Muell.-Arg. in Mart. Fl. Bras. 6¹: 138. 1860.

KEY TO THE SUBGENERA

- A. Calyx not immediately subtended by bracts; species of North America Subgen. I. *TELOSIPHONIA*
- AA. Calyx immediately subtended by bracts; species of South America Subgen. II. *EUMACROSIPHONIA*

The congrenericity of the two subgenera of *Macrosiphonia* may well be questioned. Their greatly separated ranges of distribution, coinciding roughly with the extremes of the extensive distribution of the large genus *Mandevilla*, would appear to allow the interpretation of parallel or independent origin as the result of somewhat similar environment as more logical than the supposition of a previously more extended range. As has already been pointed out, however, the existing distinctions between *Macrosiphonia* and *Mandevilla* are extremely tenuous. Further segregation of the former, therefore, appears inadmissible at the present time. On the other hand, the species included within *Macrosiphonia* form such a distinctive element that it does not appear desirable to unite them with *Mandevilla*.

Subgen. I. *TELOSIPHONIA* Woodson, n. subgen.
Flowers mostly solitary, occasionally 2, rarely 3-4. Peduncle

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manifest or obsolete; pedicels always manifest. Calyx foliaceous or somewhat petalaceous, not immediately subtended by bracts. Suffrutescent herbs (fruticose in *M. Hesperia*) of northern and central Mexico and the extreme southwestern United States. *Spp. 1-5.*

KEY TO THE SPECIES

- a. Plants fruticose; stems about 1 m. tall, ligneous throughout. 1. *M. Hesperia*
- aa. Plants suffrutescent; stems 0.1–0.3 m. tall, predominantly herbaceous.
 - b. Corolla-tube barely as long as the throat, or shorter; inflorescence 1–3 (rarely 4-) flowered.
 - c. Leaves ovate to ovate-elliptic, 1.5–3 cm. long, minutely puberulent to glabrate; inflorescence without an evident peduncle; plants of southern Arizona, extreme southwestern New Mexico, and northern Sonora. 2. *M. Brachysiphon*
 - cc. Leaves narrowly oblong to linear, 2–9 cm. long, hirtellous to glabrate above, tomentulose beneath; inflorescence with an evident peduncle; plants of northeastern and central Mexico. 3. *M. hypoleuca*
 - bb. Corolla-tube much longer than the throat; flowers solitary (rarely 2–3 in 4).
 - c. Calyx-lobes somewhat petalaceous. 4. *M. lanuginosa*
 - cc. Calyx-lobes foliaceous. 5. *M. Macrostiphon*

1. ***Macrosiphonia Hesperia* I. M. Johnston, Proc. Cal. Acad. Sci. IV. 12: 1125. 1924.**

Erect or rather diffuse shrubs 0.7–1.0 m. tall; stems ligneous throughout, densely and minutely puberulent when young, becoming glabrate; leaves opposite, shortly petiolate, ovate-orbicular, apex abruptly rounded, mucronulate, frequently more or less retuse, base broadly and very obscurely cordate, 2–3 cm. long, 1.8–2.5 cm. broad, subcoriaceous, hirtellous above, densely tomentulose beneath; petioles 0.2–0.3 cm. long; inflorescence terminal, somewhat shorter than the subtending leaves, bearing 1–2(–3) white, vespertine flowers; pedicels 0.4–0.7 cm. long, somewhat accrescent in fruit; bracts minutely linear; calyx-lobes oblong to oblong-spatulate, 0.8 cm. long, densely and minutely hirtellous; corolla infundibuliform, glabrous without, the proper-tube 4–5 cm. long, about 0.1 cm. in diameter at the base, the throat narrowly conical or subtubular, 0.8 cm. long, about 0.3–0.4 cm. in diameter at the orifice, the lobes obliquely obovate, 1.25 cm. long, widely spreading; follicles more or less torulose, 10–12 cm. long, essentially glabrous; seeds 0.5–0.75 cm. long, the tawny coma of approximately equal length.

MEXICO: BAJA CALIFORNIA: Puerto Bellandra, Carmen Island, May 21, 1921, *Johnston* 3807 (CA, TYPE, US, MBG, photograph); Espiritu Santo Island, the isthmus, rocky ground in the upper part of gulches, May 31, 1921, *Johnston* 3984 (CA); Agua Verde Bay, frequent on ledges and to some extent in gravel in a large canyon back from bay, May 26, 1921, *Johnston* 3888 (CA); head of Concepcion Bay, April 6, 1911, *Rose* 16700 (NY, US); Carmen Island, Nov. 1-7, 1890, *E. Palmer* 841 (G, US).

2. Macrosiphonia Brachysiphon (Torr.) A. Gray, Syn. Fl. 2¹: 83. 1878; Hemsl. Biol. Centr.-Am. Bot. 2: 315. 1882; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 168. 1895.

Echites Brachysiphon Torr. Bot. Mex. Bound. Surv. 158. 1859.

Erect or diffuse, suffrutescent herbs 1-3 dm. tall; stems densely and minutely puberulent when young, becoming glabrate; leaves opposite, shortly petiolate, ovate to ovate-elliptic, apex acute, base abruptly rounded to obtuse, 1.5-3.0 cm. long, 0.7-1.5 cm. broad, membranaceous, either surface minutely puberulent to glabrate; petioles 0.1-0.2 cm. long; inflorescence terminal, bearing 1-3 white, vespertine flowers, the peduncle scarcely manifest, or obsolete; pedicels 0.5-1.25 cm. long, somewhat accrescent in fruit; bracts minutely linear to linear-lanceolate; calyx-lobes narrowly oblong, acute to acuminate, 0.5-0.7 cm. long, 0.2-0.3 cm. broad, somewhat petalaceous, minutely puberulent to glabrate; corolla infundibuliform, densely and minutely puberulent-papillate without, the proper-tube 1.0-1.5 cm. long, about 0.1 cm. in diameter at the base, the throat narrowly conical or subtubular-conical, 1.0-1.25 cm. long, about 0.4 cm. in diameter at the orifice, the lobes obliquely obovate, acuminate, 0.7-1.3 cm. long, widely spreading; follicles slender, continuous or slightly articulated, 8-10 cm. long, minutely puberulent-papillate; seeds about 0.5 cm. long, the tawny coma about 1 cm. long.

UNITED STATES: ARIZONA: 8 mi. south of Vail, Aug. 31, 1903, *Jones* s. n. (MBG, S, US); Santa Cruz River, near Nogales, Aug. 15, 1900, *Trelease* 353 (MBG); Montezuma Canyon, Huachuca Mts., July 10, 1909, *Wilcox* s. n. (MBG, NY, US); Nogales, May 24, 1892, *Brandegee* s. n. (UC); Connolly's Ranch, Huachuca Mts., Aug., 1882, *Lemmon* s. n. (UC, US); ravines in mountains on the Wallen road, near Davidson's Springs, Aug. 4, 1867, *E. Palmer* 205 (MBG); Sonrita Valley, alt. 5500 ft., Aug., 1874, *Rothrock* 646 (FM, US); data incomplete, *Wright* 1665 (G, MBG, NY, US); NEW MEXICO: SONORA: between Nogales and Cocospora Ranch, Aug. 15-17, 1904, *Griffiths* 6781 (MBG); Las Cuervas, alt. 4900 ft., Oct. 15, 1890, *Hartmann* 157 (G);

Hermosillo, 1888, *Crawford s. n.* (G); about 15 mi. below U. S. boundary, 1912, Ricketts s. n. (US); Niggerhead Mts., near monument no. 82, Aug. 15, 1893, *Mearns* 1884 (US); San Jose Mts., alt. 6000 ft., Aug. 11, 1893, *Mearns* 1755 (US); San Bernardino, Aug., 1882, *Thurber* 764 (NY).

3. *Macrosiphonia hypoleuca* (Benth.) Muell.-Arg. *Linnaea* 30: 452. 1860; *Hemsl. Biol. Centr.-Am. Bot.* 2: 315. 1882; K. Sch. in Engl. & Prantl, *Nat. Pflanzenfam.* 4²: 168. 1895.

Echites hypoleuca Benth. *Pl. Hartw.* 23. 1839; A. DC. in DC. *Prodr.* 8: 472. 1844.

Echites suaveolens Mart. & Gal. *Bull. Acad. Roy. Brux.* 11¹: 356. 1844, not A. DC.

Macrosiphonia Wrightii A. Gray, *Syn. Fl.* 2¹: 83. 1878.

Rhodocalyx suaveolens (Mart. & Gal.) Miers, *Apoc. So. Am.* 139. 1878.

Rhodocalyx hypoleucus (Benth.) Miers, loc. cit. 140. 1878.

Erect or diffuse, suffrutescent herbs 1–3 dm. tall; stems densely puberulent when young, eventually becoming glabrate; leaves opposite, shortly petiolate, narrowly oblong to linear, apex acute, infrequently acuminate or narrowly obtuse, base abruptly rounded, obtuse, or truncate, 2–9 cm. long, 0.4–2.25 cm. broad, firmly membranaceous, above dark green, hirtellous to glabrate, beneath much paler, finely tomentulose; inflorescence terminal, bearing 1–3(–4) white, vespertine flowers, the peduncle manifest, somewhat shorter than the subtending leaves; pedicels 0.5–1.0 cm. long, somewhat accrescent in fruit; bracts minutely linear; calyx-lobes narrowly oblong-lanceolate, acuminate, 0.5–1.0 cm. long, somewhat petalaceous, minutely puberulent-tomentulose; corolla infundibuliform, finely floccose-tomentulose without, the proper-tube 1.0–2.5 cm. long, about 1.25 cm. in diameter at the base, the throat narrowly conical or subtubular, 1.5–2.5 cm. long, about 0.5–0.75 cm. in diameter at the orifice, the lobes obliquely obovate, 1.5–2.5 cm. long, widely spreading; follicles relatively stout, continuous or slightly articulated, 9–13 cm. long, finely puberulent-papillate; seeds 0.6–0.75 cm. long, the tawny coma about 1 cm. long.

MEXICO: SAN LUIS POTOSI: in montibus, Aug., 1879, *Schaffner* 489 (CA, FM, NY, UC, US); near San Luis Potosi, Aug. 18–20, 1902, E. Palmer 28 (CA, FM, G, MBG, NY, UC, US); data incomplete, 1878, *Parry & Palmer* 574 (FM, G, MBG, US); DURANGO: Sierra Madre Mts., Aug. 13, 1897, *Rose* 3474 (US); Papasquiaro, July 7,

1898, Nelson 4659 (G, US); Otinapa, July 25–Aug. 5, 1906, E. Palmer 447 (G, US); Tepehuanes, June 4–25, 1906, E. Palmer 296 (G, US); CHIHUAHUA: San Andres, Aug. 22, 1900, Trelease 351 (MBG); hills near Chihuahua, Sept.–Oct., 1886, Pringle 1108 (MBG, NY, UC); rocky hills near Chihuahua, Aug.–Oct., 1885, Pringle 390 (FM, G, MBG, NY, US); SINALOA: Cerro Colorado, vicinity of Culiacan, Nov. 1, 1904, Brandegee s. n. (G, UC, US); Ixtagua, 1922, Ortega 4712 (US); Cordon de las Trompetas, Ixtagua, San Ignacio, alt. 660 m., Aug. 17, 1918, Montes & Salazar 486 (US); Cerro Colin, Oct., 1919, Trejo 1084 (US); JALISCO: hills near Guadalajara, alt. 5000 ft.; July 10, 1902, Pringle 11014 (FM, G, MBG, NY, US); Guadalajara, Aug., 1901, Rose & Hay 6292 (G, NY, US); same locality, June 23, 1893, Pringle 4393 (FM, G, MBG, NY, UC, US, V); near Tequila, July 5–6, 1899, Rose & Hough 4752 (US); TEPIC: between Pedro Paulo and San Blascito, Aug. 4, 1897, Rose 1983 (NY, US); plains near city of Tepic, alt. 3000 ft., July 22, 1905, Goldsmith 126 (G); GUANAJUATO: 1889, Duges 242 (US); MICHOACAN: data lacking, Galeotti 1595 (V); STATE UNCERTAIN: date lacking, Hartweg 193 (K, TYPE, V, MBG, photograph).

4. Macrosiphonia lanuginosa (Mart. & Gal.) Hemsl. Biol. Centr.-Am. Bot. 2: 316. 1882.

Echites lanuginosa Mart. & Gal. Bull. Acad. Roy. Brux. 11: 357. 1844.

Rhodocalyx lanuginosus (Mart. & Gal.) Miers, Apoc. So. Am. 139. 1878.

Erect or somewhat diffuse, suffrutescent herbs 1–3 dm. tall; stems densely tomentulose, rarely glabrate; leaves opposite, subsessile, broadly oblong to ovate-elliptic, apex acute to obtuse, base broadly obtuse, rounded, or truncate, 1.5–4.0 cm. long, 0.5–2.0 cm. broad, firmly membranaceous, above dark green, finely hirtellous, beneath much paler, densely tomentulose; inflorescence terminal, bearing 1–3 white, vespertine flowers, the peduncle obsolete or scarcely evident; pedicels 0.5–1.0 cm. long, somewhat accrescent in fruit; bracts minutely linear; calyx-lobes oblong-lanceolate, acuminate, 0.5–0.75 cm. long, somewhat petalaceous; corolla infundibuliform, densely puberulent-papillate without, the proper-tube 3–6 cm. long, about 0.15 cm. in diameter at the base, the throat narrowly conical or subtubular, 1–2 cm. long, about 0.5–0.75 cm. in diameter at the orifice, the lobes obliquely obovate, 1.5–2.0 cm. long, widely spreading; follicles relatively stout, more or less articulated, 10–15 cm. long, irregularly puberulent-papillate to glabrate; seeds 0.75 cm. long, the tawny coma about 1 cm. long.

MEXICO: NUEVO LEON: between Monterey and Corralvo, May 28, 1847, Wissenzus 541 (MBG); hills near Monterey, Aug. 31, 1903, Pringle 11838 (C, FM, G, US);

PUEBLA: Tlacuiloltepec and Tres Mogotes, Aug., 1909, *Purpus* 3989 (FM, G, MBG, NY, UC, US); HIDALGO: Sierra de la Mesa, Ixmiquilpan, July-Sept., 1905, *Purpus* 1378 (FM, G, MBG, NY, UC); SAN LUIS POTOSI: Minas de San Rafael, May, 1911, *Purpus* 5206 (FM, MBG, G, NY, UC, US); same locality, Nov., 1910, *Purpus* 5055 (MBG, UC); DURANGO: Inde, alt. 2000 m., July, 1927, *Reko* 5212 (US); TAMAULIPAS: Buena Vista Hda., June 18, 1919, *Wooton* s. n. (US); COAHUILA: Monclova, Aug. 23-31, 1880, E. Palmer 807 (G, MBG, US); vicinity of Saltillo, July 25, 1905, E. Palmer 708 (US).

Strikingly intermediate in morphology and distribution between *M. hypoleuca* and *M. Macrosiphon*, and suggesting a hybrid origin.

5. **Macrosiphonia Macrosiphon** (Torr.) A. A. Heller, Muhlenbergia 1: 2. 1900.

Echites Macrosiphon Torr. Bot. Mex. Bound. Surv. 158. pl. 43. 1859.

Macrosiphonia Berlandieri A. Gray, Syn. Fl. 2¹: 83. 1878; Hemsl. Biol. Centr.-Am. Bot. 2: 315. 1882; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 168. 1895.

Erect or somewhat diffuse, suffrutescent herbs 1.5-3.0 dm. tall; stems densely tomentulose when young, eventually becoming glabrate; leaves opposite, petiolate, ovate-elliptic to suborbicular, apex rather abruptly obtuse or rounded, infrequently acute or somewhat retuse, mucronulate, base obtuse or rounded, 1.5-5.0 cm. long, 1.0-4.5 cm. broad, firmly membranaceous, either surface densely tomentulose; petioles 0.2-1.0 cm. long; inflorescence terminal, bearing a solitary, white, vespertine flower, the peduncle obsolete or essentially so; pedicels 0.2-0.5 cm. long; bracts linear to ovate-lanceolate, 0.3-0.6 cm. long; calyx-lobes lanceolate to ovate, acute to acuminate, 1-2 cm. long, 0.2-0.5 cm. broad, conspicuously foliaceous, densely tomentulose; corolla infundibuliform, densely puberulent-papillate without, the proper-tube 3.5-9.0 cm. long, about 0.15 cm. in diameter at the base, the throat narrowly conical to subtubular, 1.0-2.5 cm. long, about 0.5-0.75 cm in diameter at the orifice, the lobes obliquely obovate, 1.5-3.0 cm. long, widely spreading; follicles relatively slender, continuous, 10-15 cm. long, puberulent-papillate to glabrate; seeds 0.5 cm. long, the pale tawny coma about 1 cm. long.

UNITED STATES: TEXAS: ledges, high limestone hills, Lacey's Ranch, Kerr Co., (179)

June 2, 1916, *E. J. Palmer* 10018 (MBG); dry hills, Upper Hondo, June, year lacking, *Reverchon* 1878 (FM, MBG, NY, US); Comanche Springs, June, 1849, *Lindheimer* 984 (C, FM, G, MBG, NY, UC, US); hills near Van Horn, July 9, 1900, *Eggeri* s. n. (MBG); infrequent, slopes, Limpia Canyon, Presidio Co., Aug. 22, 1919, *Hanson* 758 (G, MBG, NY, US); Pena Colorado, date lacking, *Howard* s. n. (FM, MBG, US); dry limestone hillsides, upper Seco Creek, Bandera Co., June 18, 1916, *E. J. Palmer* 10243 (MBG); chaparral, first ridge east of Juniper Canyon, Chisos Mts., Brewster Co., alt. 5500 ft., July 15-18, 1921, *Ferris & Duncan* 2939 (CA, MBG, NY); higher ridges, vicinity of Mt. Livermore, Davis Mts., Jeff Davis Co., July 9-12, 1921, *Ferris & Duncan* 2520 (CA, MBG, NY, US); dry calcareous hills, Barksdale, Edwards Co., Oct. 11, 1916, *E. J. Palmer* 10995 (MBG); Marathon, Aug., 1925, *Bogach* 948 (US); Marfa, June 3, 1926, *Orcutt* 1218 (US); Glass Mts., Aug. 19, 1925, *Tharp* 3646 (US); Ft. Pena Colorado, Aug., 1925, *Tharp* 4648 (US); southern slopes of higher mountain-tops, 5 mi. west of Comanche Springs, June-Aug., 1849, *Lindheimer* 128 (G, MBG); rocky slopes, Blue Creek Canyon, Brewster Co., alt. 1520 m., June 26, 1931, *Moore & Steyermark* 3243 (MBG); data incomplete: May-Oct., 1849, *Wright* 557 (FM, G, MBG, UC); *Berlandier* 3197 (G, MBG, US).

MEXICO: CHIHUAHUA: Santa Eulalia Plains, June-Aug., 1885, *Wilkinson* s. n. (FM, UC, US); hills near Chihuahua, March-Oct., 1886, *Pringle* 694 (FM, G, MBG, NY, US); DURANGO: from Ramon to Inde, Aug. 11-14, 1898, *Nelson* 4692 (G, MBG, US).

Subgen. II. EUMACROSIPHONIA Woodson, n. subgen.

Flowers few to several, rarely solitary. Peduncle elongate, usually greatly surpassing the subtending leaves; pedicels relatively indistinct. Calyx somewhat foliaceous, immediately subtended by bracts. Suffrutescent herbs of southeastern Brazil and adjacent Paraguay, Uruguay, and Argentina. *Spp.* 6-10.

KEY TO THE SPECIES

- a. Corolla-throat narrowly conical or subtubular.
- b. Leaves not concolorous, variously pubescent above, densely arachnoid-lanate beneath.
 - c. Plants essentially erect; leaves strictly opposite, 3-7 cm. long.
 - d. Inflorescence several-flowered; upper leaf-surface densely velutinous interspersed with long hairs..... 6. *M. Martii*
 - dd. Inflorescence 1-flowered; upper leaf-surface simply pilose or slightly as above..... 7. *M. virescens*
 - cc. Plants more or less decumbent; leaves verticillate or rarely opposite in individuals, 1.5-5.0 cm. long..... 8. *M. petraea*
- bb. Leaves concolorous, either surface densely arachnoid-lanate..... 9. *M. Velame*
- aa. Corolla-throat broadly conical to campanulate..... 10. *M. longiflora*

6. **Macrosiphonia Martii** Muell.-Arg. in Mart. Fl. Bras. 6¹: 138. 1860; Miers, Apoc. So. Am. 130. 1878.

Echites virescens Stadelm. not St. Hil. ex Muell.-Arg. loc. cit. 139. 1860, nom. nud. in synon.

Erect or ascending, suffrutescent herbs 1.5–4.0 dm. tall; stems relatively stout, densely arachnoid-lanate; leaves opposite, shortly petiolate to subsessile, broadly oblong to oblong-elliptic, apex acute, base truncate to broadly and very obscurely cordate, 5–7 cm. long, 1.5–3.0 cm. broad, firmly membranaceous, above dark green, densely velutinous interspersed with long, weak hairs, beneath much paler, densely arachnoid-lanate; inflorescence terminal, 2–9-flowered, the peduncle 15–45 cm. long; pedicels 0.3–0.5 cm. long; calyx-lobes lanceolate, acuminate, 1.0–1.5 cm. long; corolla infundibuliform, finely arachnoid-lanate without, the proper-tube 4.5–6.0 cm. long, about 0.2 cm. in diameter at the base, the throat narrowly conical to subtubular, 1.75–2.25 cm. long, about 0.75 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 1.25–1.5 cm. long, widely spreading; follicles relatively stout, articulated, 12–15 cm. long, finely and sparsely arachnoid-lanate without; seeds 1.5 cm. long, the brilliant tawny coma about 2.5 cm. long.

BRAZIL: GOIAS: campos, Mission of Duro, Febr. 10, 1839, *Gardner* 3312 (B, BB, BM, K, NY, V, MBG, photograph); S. Lusia Megaponte, date lacking, *Pohl* 970 (V); data incomplete: 1842, *Glaixou* 21732 (Bx, C, K); *Gardner* 3889 (B, BM, K, V); MINAS GERAES: Serra do Curral, prope Bello Horizonte, campo, March 23, 1929, *Ducke* 21811 (B); Caete, Jan. 24, 1921, *Hoehne* 5094 (B); in campis, Lagoa Santa, March, 1835, *Lund* s. n. (C); Lagoa Santa, Jan. 15, 1864, *Engle* s. n. (C); same locality, Jan. 25, March 2, Sept. 28, 1864, *Warming* s. n. (C); data incomplete: 1838, *Claussen* 334 (G, NY); 1831, *Ackermann* s. n. (Bx); MATTO GROSSO: data incomplete, May 29, 1899, *Pilger* 643 (B).

7. *Macrosiphonia virescens* (St. Hil.) Muell.-Arg. in Mart. Fl. Bras. 6¹: 139. 1860; Miers, Apoc. So. Am. 130. 1878.

Echites virescens St. Hil. Bull. Soc. Phil. 77. 1824; Mem. Mus. Paris 12: 324. 1825; A. DC. in DC. Prodr. 8: 472. 1844.

Macrosiphonia virescens (St. Hil.) Muell.-Arg. var. *Missionum* Chod. Bull. Soc. Bot. Genève II. 11: 223. 1920.

Erect or ascending, suffrutescent herbs 1–3 dm. tall; stems relatively slender, fulvous-pilose when young, eventually becoming glabrate; leaves opposite, shortly petiolate, narrowly oblong-elliptic, acute, base abruptly rounded to obtuse, 3–7 cm. long, 1.0–1.5 cm. broad, firmly membranaceous, above dark green, pilose or pilosulose to glabrate, beneath much paler,

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densely and minutely arachnoid-lanulose; petioles 0.2–0.3 cm. long; inflorescence terminal, 1- (rarely few-?) flowered, the peduncle 5–10 cm. long; calyx-lobes linear-lanceolate, long-acuminate, 1.75–2.5 cm. long, laxly pilosulose without; corolla infundibuliform, finely and rather sparsely arachnoid-lanulose without, the proper-tube 6.0–7.5 cm. long, about 0.2 cm. in diameter at the base, the throat narrowly conical to subtubular, 2.0–2.5 cm. long, about 0.75 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 1.75–2.0 cm. long, widely spreading; follicles relatively stout, articulated, 20–25 cm. long, sparsely arachnoid-lanulose to glabrate; seeds 1 cm. long, the brilliant tawny coma about 2.5 cm. long.

BRAZIL: SÃO PAULO: Cascaval, Dec. 1, 1920, Gehrt 4652 (B); data incomplete: Sello s. n. (B); Claussen 513 (DC); PARANA: in campo, Turma, alt. 800 m., Oct. 19, 1914, Dusen 15653 (G, MBG).

ARGENTINA: MISIONES: San Ignacio, Oct. 30, 1892, Niederlein 92 (B); same locality, Sept. 9, 1919, Munies 94 (MBG); same locality, in campis siccis, date lacking, Chodat & Vischer 205 (BB).

8. Macrosiphonia petraea (St. Hil.) K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 168. 1895.

Macrosiphonia verticillata Muell.-Arg. in Mart. Fl. Bras. 6¹: 140. 1860; Miers, Apoc. So. Am. 131. 1878.

More or less decumbent, suffrutescent herbs 0.5–3.0 dm. tall; stems relatively slender, fulvous-pilose or pilosulose when young, infrequently becoming glabrate when fully mature; leaves ternate or quaternate, infrequently opposite in individuals, sessile or subsessile, oblong-lanceolate to linear-filiform, rarely ovate-elliptic, acute to acuminate, base truncate or rounded, coriaceous to subcoriaceous, above dark green, usually nitidulous, simply pilose or pilosulose, beneath densely arachnoid-lanulose; inflorescence terminal or subterminal, 1–4-flowered, the peduncle 3–10 cm. long; calyx-lobes linear-lanceolate, long-acuminate, 1.5–2.5 cm. long; corolla infundibuliform, finely arachnoid-lanulose without, the proper-tube 6–8 cm. long, about 0.15 cm. in diameter at the base, the throat narrowly conical or subtubular, 2.0–2.5 cm. long, about 0.75 cm. in diameter at the orifice, the lobes obliquely obovate, shortly acuminate, 1.75–2.25 cm. long, widely spreading; follicles relatively slender, distantly articulated

or submoniliform, 15–25 cm. long, finely arachnoid-lanulose to glabrate; seeds about 1 cm. long, the brilliant-tawny coma about 2.25 cm. long.

Var. typica.

Echites petraea St. Hil. Mem. Mus. Paris 12: 322. 1825;
A. DC. in DC. Prodr. 8: 472. 1844.

Macrosiphonia verticillata Muell.-Arg. α . *petraea* (St. Hil.)
Muell.-Arg. in Mart. Fl. Bras. 6¹: 141. 1860.

Macrosiphonia verticillata Muell.-Arg. β . *intermedia* Muell.-
Arg. loc. cit. 1860.

Stems 1–3 dm. tall; leaves oblong-lanceolate to oblong-elliptic,
1.5–5.0 cm. long, 1.75–2.5 cm. broad; inflorescence 1–4-flowered.

BRAZIL: RIO GRANDE DO SUL: São João, date lacking, *St. Hilaire* 2597 (DL); Sta.
Ana, May 26–28, 1907, *Herter* 3128 (B).

PARAGUAY: in regione lacus Ypacaray, Jan., 1913, *Hassler* 11477 (C, G, MBG);
in campo, Nov., year lacking, *Hassler* 3538 (B, G, MBG, NY, US); zwischen Rio
Apa u. Rio Aquidaban, 1908–09, *Fiebrig* 4645 (G).

ARGENTINA: CHACO: Las Breñas, alt. 250 m., Nov., 1929, *Venturi* 9773 (MBG);
CORDOBA: data incomplete, Jan. 16, 1902, *Stuckert* s. n. (UC); Nov. 19, 1880, *Galander*
s. n. (NY); zw. Las Tefas u. Los Estadanos, gebiet des Rio Tercero, March 27, 1876,
Hieronymus s. n. (B); FORMOSA: en el campo, April 8, 1919, *Jørgensen* 3023 (FM, G);
MISSIONES: Posadas, in rupestribus ad Praed. "La Ganja," Nov. 12, 1907, *Ekman*
1591 (MBG).

URUGUAY: Sta. Rosa, Dept. Artigas, Nov., 1927, *Herter* 570 (NY); Concepcion,
Nov., 1877, *Lorentz* 1207 (B); Montevideo, date lacking, *Sellow* 693 (V, MBG,
photograph).

Var. *pinifolia* (St. Hil.) Woodson, comb. nov.

Echites pinifolia St. Hil. Mem. Mus. Paris 12: 325. 1825;
A. DC. in DC. Prodr. 8: 471. 1844.

Echites grandiflora Desf. var. *minor* Hook. Jour. Bot. 1:
286. 1834.

Echites Lambertiana Gillies, ex Hook. loc. cit. 1834, nom.
nud. in synon.

Macrosiphonia verticillata Muell.-Arg. γ . *peduncularis* Muell.-
Arg. in Mart. Fl. Bras. 6¹: 141. 1860.

Macrosiphonia verticillata Muell.-Arg. δ . *pinifolia* (St. Hil.)
Muell.-Arg. loc. cit. 1860.

Macrosiphonia pinifolia (St. Hil.) Miers, Apoc. So. Am. 131.
1878.

Macrosiphonia prostrata Miers, loc. cit. 1878.

- Echites multifolia* Miers, loc. cit. 1878, nom. nud. in synon.
Macrosiphonia pinifolia (St. Hil.) Malme, Bull. Herb. Boiss. II. 4: 257. 1904, sphalm.
Macrosiphonia pinifolia (St. Hil.) Malme var. *intermedia* (Muell.-Arg.) Malme, loc. cit. 1904.
Macrosiphonia Balansae Chod. Bull. Soc. Bot. Genève II. 11: 224. 1920.
Macrosiphonia pinifolia (St. Hil.) Malme f. *glabrata* Chod. loc. cit. 225. 1920.
Macrosiphonia pinifolia (St. Hil.) Malme f. *setosa* Chod. loc. cit. 1920.
Macrosiphonia pinifolia (St. Hil.) Malme f. *peduncularis* (Muell.-Arg.) Malme, Arkiv f. Bot. 21A⁶: 14. 1927.
Macrosiphonia peduncularis (Muell.-Arg.) Hand.-Mzt. Denkschr. Akad. Wissenschaft. Wien 79: 386. 1931.

Stems 0.5–2.0 dm. tall; leaves linear to filiform, 1.5–3.0 cm. long, 0.1–0.3 cm. broad; inflorescence 1-flowered.

BRAZIL: PARANA: Porto Amazonas, ad fl. Iguassu, alt. 735 m., Jan. 4, 1916, *Dusen 1000a* (MBG); same data, *Dusen 18056* (FM, G, NY); Ponta Grossa, in campo, alt. 880 m., Jan. 10, 1915, *Dusen s. n.* (G); data incomplete: *Widgren 578* (US); *Riedel s. n.* (G); *Lund s. n.* (C); *Sello s. n.* (B).

PARAGUAY: central Paraguay, 1888–90, *Morong 4204* (G, MBG, US); Santa Elisa, Gran Chaco, Dec., 1903, *Rojas 2654* (G, V); in vicinities Caaguazu, March, 1905, *Hassler 9081* (V).

URUGUAY: Montevideo, date lacking, *Sello s. n.* (V); data incomplete: *Arechavaleta s. n.* (V).

9. *Macrosiphonia Velame* (St. Hil.) Muell.-Arg. in Mart. Fl. Bras. 6¹: 138. pl. 42. 1860; Miers, Apoc. So. Am. 129. 1878; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 168. 1895.

Echites Velame St. Hil. Bull. Soc. Phil. 77. 1824; Mem. Mus. Paris 12: 324. 1825; Stadelm. Flora 24¹: Beibl. 61. 1841; A. DC. in DC. Prodr. 8: 471. 1844.

Macrosiphonia Velame (St. Hil.) Muell.-Arg. β . *goyazensis* Muell.-Arg. loc. cit. 1860.

Erect or ascending, suffrutescent herbs 1.5–4.5 dm. tall, densely arachnoid-lanate throughout; stems relatively stout; leaves opposite, very shortly petiolate to subsessile, broadly ovate- to oblong-elliptic, acute to obtuse, base rounded or truncate, 3–7 cm. long, 1.25–5.0 cm. broad, subcoriaceous, either

surface about uniformly pale; petioles 0.2–0.4 cm. long; inflorescence terminal, 3–8-flowered, the peduncle 3–8 cm. long; calyx lobes linear-lanceolate, long-acuminate, 1.5–2.0 cm. long; corolla infundibuliform, densely arachnoid-lanate without, the proper tube 7–8 cm. long, about 0.2 cm. in diameter at the base, the throat narrowly conical or subtubular, 1.5–2.0 cm. long, about 0.75 cm. in diameter at the orifice, the lobes obliquely obovate, 2.5–3.5 cm. long, widely spreading; follicles relatively stout, rather distantly articulated or moniliform, 15–25 cm. long, densely arachnoid-lanate to glabrate; seeds 1 cm. long, the brilliant-tawny coma about 2 cm. long.

BRAZIL: MINAS GERAES: in campis ad Lagos Santa, Febr. 3, 1864, Engle s. n. (C); Lagoa Santa, March 28, 1864, Warming s. n. (C, NY, V); Ouro Branco, March 9, 1898, Glaziou 15214 (BM, C); in campis, Caxoeira do Campo, Febr., 1835, Lund s. n. (C); same locality, 1840, Claussen 172 (DL); Caldas, 1843, Regnell 878 (B, Bx, C, FM, K, US); Poços de Caldas, Jan. 15, 1919, Hoehne 2857 (B); Caraça, Febr., 1885, Mendonça 506 (B); Chico Lobo, dans les champs, 1894–95, Glaziou 21731 (B, Bx, C, K, NY); campo ad fl. S. Francisco, 1842, Pohl s. n. (Bx, V); Rio Campanero, Nov., 1883, Dent s. n. (BM); RIO DE JANEIRO: date lacking, Glaziou 9507 (B); environs de Rio de Janeiro et d'Ouro Preto, 1883–84, Glaziou 15215 (K); Serra da Pitangui, date lacking, Sello 1684 (B); data incomplete, Aug.–April, 1840, Claussen 1673 (K, MBG); 333 (C, NY); 336 (B); 711 (B); 108 (B); 511 (DC); July, 1916, Porto 7931 (B); SÃO PAULO: steppe, norden des Staates S. Paulo, alt. 800 m., Oct., year lacking, Peckholt 18 (B).

10. *Macrosiphonia longiflora* (Desf.) Muell.-Arg. in Mart. Fl. Bras. 6: 140. pl. 43. 1860; Miers, Apoc. So. Am. 130. 1878; K. Sch. in Engl. & Prantl, Nat. Pflanzenfam. 4²: 168. pl. 58, figs. m-n. 1895.

Echites longiflora Desf. Mem. Mus. Paris 5: 177. pl. 20. 1819; Stadelm. Flora 24¹: Beibl. 64. 1841; A. DC. in DC. Prodr. 8: 471. 1844.

Echites Guarantica St. Hil. Bull. Soc. Phil. 77. 1824; Mem. Mus. Paris 12: 324. 1825; A. DC. loc. cit. 472. 1844.

Echites augusta Vell. Fl. Flum. 114. 1830; Icon. 3: pl. 48. 1827.

Echites grandiflora Desf. ex Hook. Jour. Bot. 1: 286. 1834, sphalm.

Echites grandiflora Desf. var. *major* Hook. loc. cit. 1834.

Macrosiphonia Guarantica (St. Hil.) Muell.-Arg. loc. cit. 139. 1860; Miers, loc. cit. 129. 1878.

Macrosiphonia longiflora (Desf.) Muell.-Arg. var. *Guarantica*
 (St. Hil.) Malme, Bihang till K. Sv. Vet. Akad. Handl.
 Afd. III. 24^o: 18. 1899.

Erect or ascending, suffrutescent herbs 1.5–3.0 dm. tall; stems relatively stout, densely arachnoid-lanate; leaves opposite, subsessile to very shortly petiolate, ovate to ovate-elliptic, infrequently ovate-lanceolate, acute to acuminate, base rounded and rather broadly and obscurely cordate, 2–6 cm. long, 1–4 cm. broad, coriaceous, above dark green, sparsely arachnoid-lanulose when young, usually glabrate when fully mature, beneath much paler, persistently and densely arachnoid-lanate; inflorescence 1–3-flowered, the peduncle 6–20 cm. long; calyx-lobes linear-lanceolate, long-acuminate, 1.5–2.0 cm. long, densely arachnoid-lanate; corolla infundibuliform, densely arachnoid-lanulose without, the proper-tube 8–14 cm. long, about 0.3 cm. in diameter at the base, the throat broadly conical or campanulate, 2.0–2.5 cm. long, about 1.75–2.25 cm. in diameter at the orifice, the lobes obliquely obovate, indistinctly acuminate, 2.5–4.0 cm. long, widely spreading; follicles relatively stout, distinctly articulated or moniliiform, 15–20 cm. long, sparsely arachnoid-lanulose to glabrate; seeds about 1 cm. long, the brilliant-tawny coma about 2 cm. long.

BRAZIL: BAHIA: Jacobina, date lacking, *Blanchet* 3373 (FM, NY, V); Jacobina-Caceres, Oct., 1908, *Hoehne* 335 (US); MINAS GERAES: Lagoa Santa, Oct. 24, 1863, *Warming* s. n. (C); same locality, Nov., 1915, *Hoehne* 8634 (B); Cachoeira, 1842, *Claussen* 332 (C, G, V); S. Luzia, date lacking, *Pohl* 895 (V); data incomplete: *Lund* s. n. (C); *Glaziov* 21733 (C); *Widgren* 582 (US); *Regnell* 189 (US); SÃO PAULO: in campis, Nov., 1833, *Lund* 886 (C); RIO GRANDE DO SUL: Sta. Ana, May 26–28, 1907, *Herter* 3128 (B); PARANA: Jaguariahyva, in campo, alt. 740 m., Dec. 20, 1915, *Dusen* 17456 (FM, G, MBG); same locality, Nov. 22, 1914, *Dusen* 16031 (NY, US); same locality, Oct. 30, 1910, *Dusen* 10676 (G, MBG); MATTO GROSSO: data incomplete, July, 1892, *Kunze* s. n. (FM, NY); DATA INCOMPLETE: *Riedel* s. n. (NY, V, G); *Sellow* 4500 (B, V).

PARAGUAY: in regione collium, Cordillera de Villa-Rica, Jan., 1905, *Hassler* 3768 (G, V); same data, *Hassler* 8825 (G, V); central Paraguay, 1888–90, *Morong* 420 (NY, US); Cordillera de Altos, Nov. 7, 1902, *Fiebrig* 387 (FM); same locality, Nov. 25, 1902, *Fiebrig* 474 (FM); Centurion, zwischen Rio Apa u. Rio Aquidaban, Oct., 1909, *Fiebrig* 4183 (G); in regione vicine Igatimi, Sept., year lacking, *Hassler* 4724 (V); Cerro Pelado, Dec., 1929, *Jørgensen* 3446 (MBG, US).

Also reported from northern Argentina.

(To be continued)

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REPORT OF A BOTANICAL EXPEDITION INTO THE MOUNTAINS OF WESTERN TEXAS

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INTRODUCTION

The mountainous country west of the Pecos has always challenged botanical collectors. The floras of many ranges are still totally unknown, although the collections of the pioneer botanists who passed through the region (Wright, Nealley, Schott, Bigelow, and Havard) have given us a fairly complete knowledge of the flora of the foothills and of a few of the mountain ranges. In the early part of this century, Baker, Earle and Tracy visited the Davis Mountains. Up to the time of her death, Dr. Mary S. Young was an enthusiastic student of this flora, visiting the Davis, Guadalupe, and Chisos ranges. The fact that these mountains constitute a meeting ground between the northern outposts of the typical Mexican flora and the southern relics of a northern Rocky Mountain flora has recently interested numerous botanists in the region.

We passed two months (June and July, 1931) in the region west of the Pecos, concentrating our collecting in the Davis, Chisos, and Guadalupe mountain ranges, as well as studying the flora of their foothills and the Rio Grande.

GENERAL GEOLOGY

In the United States the southernmost continuation of the Rocky Mountains is represented in western Texas by three ranges of mountains which stretch in a northwest-southeasterly direction in the region between the Pecos River and the Rio Grande. Northward all three of these ranges extend into New Mexico, and southward the two eastern ranges protrude into Mexico. The Rio Grande has cut a series of canyons through the two eastern ranges, a fact which suggests that the river was in existence before the mountains were uplifted across its course.

The westernmost range, the Franklin Mountains, is a continua-

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tion of the Organ and San Andreas ranges of New Mexico, and ends a few miles north of El Paso.

The next range to the east enters Texas from the north as the Hueco Mountains on the west, and the Cornudas Mountains on the east. This broad dissected plateau, the Diablo Plateau, is separated from the Franklin Mountains by the low Hueco Basin. The plateau is surmounted by subsidiary mountains, one set of which is near the eastern margin and the other near the western. Beginning on the north with the Hueco Mountains and Cerro Alto, this western line of mountains continues south-easterly in the Finlay, Sierra Blanca, Malone, Quitman, Devil's Ridge, and Eagle Mountains. The eastern line comprises successively from north to south the Cornudas, Sierra Tinaja Pinta, Sierra Prieta, Sierra Diablo, Baylor, Carrizo, Van Horn, Tierra Vieja, Chinati, Cienaga, Sierra Bofecillos, and the Mesa de Anguila. It is through this last elevated portion that the Rio Grande has cut the Santa Helena Canyon, approximately 1800 feet in depth and only 50 feet across at the base in some places.

The easternmost range of Trans-Pecos Texas, at this latitude the front range of the Western Cordillera, enters Texas on the North as the Guadalupe Mountains, and continues successively southward as the Delaware, the Davis (Limpia or Apache), the Mount Ord, the Santiago, and the Sierra del Carmen. The latter continues into Mexico trenched by the deep narrow canyons of the Rio Grande.

There are other minor mountains east of the front range proper. Such are the Barilla, Sierra Madera, Glass, the Marathon Uplift, and a series of four long ridges cut through by the Rio Grande in deep canyons between the Sierra del Carmen and the mouth of San Francisco Creek. These are regarded as subsidiary arches and folds in Comanchean and earlier sedimentary rocks and in later lavas (in the Barilla Mountains). These folds gradually die out eastward as the intensity of the orogenic forces decreased in that direction.

Most of the mountains are of the broad, somewhat flat, plateau type. A few, such as the Guadalupe and Chisos, are very rugged and greatly dissected. Elevations in the Trans-Pecos Mountain region range from 1500 feet in the Rio Grande valley,

at the eastern base of the Sierra del Carmen, to about 9500 feet in Guadalupe Peak near the New Mexico line, the highest point in Texas. Although the majority of the Trans-Pecos mountains are composed of folded and faulted sedimentary strata, some include areas of igneous rocks. These igneous rocks have intruded through or bowed up the sedimentary strata, as in the Chisos Mountains, or they have formed great plateau areas of lava flows, as is found in the Davis Mountains.

This mountainous country was formed by the uplifts and foldings which occurred at or towards the close of the Pliocene, and consequently is geologically recent. A brief summary of the recent Cenozoic geological history will serve to bring out this point:

"At the end of the Eocene most of Texas became dry land and has remained dry land ever since. The only portion of Texas submerged beneath the waters of the Gulf since the close of the Eocene was a relatively narrow fringe along the present gulf border. All the Oligocene, Miocene, and Pliocene deposits of Texas are of non-marine origin in the region of their outcrops.

"Near or at the close of the Pliocene the mountains of New Mexico and Trans-Pecos Texas were again uplifted. In the Trans-Pecos mountain region the rocks were again folded and huge blocks of the earth surface were uplifted along lines of great dislocations or faults. The mountains of Trans-Pecos Texas as we see them today were formed at this time by these movements. Since then the mountains of New Mexico and Trans-Pecos Texas have been greatly eroded and debris from them was spread as a thin sheet of sands, gravels, and clays over nearly the whole of Texas. . . . Remnants of these deposits of sand and gravel, known as the Lafayette, are still found in all parts of Texas except on the surface of the Edwards Plateau and the summits and bedrock slopes of the Trans-Pecos Mountains. . . . All of the rivers of Texas, except the Rio Grande, the lower end of the Pecos, the Colorado, the Brasos, the Canadian, and possibly the Red, have cut their valleys since the Lafayette epoch. All the canyons in Texas, including . . . McKittrick canyon of the Guadalupe Mountains, Madera canyon of the Davis Mountains, the Santa Helena and other canyons of the Rio Grande, the canyon of the Pecos . . . have been cut since the beginning of the Lafayette epoch."¹

The recent epoch is one of widespread erosion of Texas land and the materials are being transported to the Gulf by the rivers and there being deposited below the level of the tide.

DESCRIPTION OF REGIONS VISITED

Davis Mountains.—For an admirable description of the ligneous flora, geology, and general features of this region, the

¹ Udden, J. A., C. L. Baker, and E. Rose. A review of the geology of Texas. Univ. Tex. Bull. 44. 1916.

reader is referred to E. J. Palmer's account.² Since he had already collected in the highest portions of these mountains, we confined our collecting to the regions of lower elevation in and around Little Aguja and Big Aguja Canyons.

Study Butte Area.—This is a region of low elevation and low relief, of heavily gullied and terraced bare hills, gypsum flats, and occasional barren sand ridges eroded from the Cretaceous Terlingua Beds and Tornillo Clays. This area is situated about 10 miles southwest of the Chisos Mountains and about 10 miles north of the Rio Grande. Plants growing on the gypsum flats, such as *Suaeda suffrutescens*, *Atriplex canescens*, *A. acanthocarpa*, are calciphiles, as are most plants of the area.

Chisos Mountains.—The flora of the Chisos Mountains includes a far greater proportion of the Mexican element than does the Davis Mountains. Although there are many species such as *Heuchera rubescens*, *Rhamnus Purshiana*, *Pseudotsuga taxifolia*, *Amesia gigantea*, and *Aquilegia chrysantha*, which come from the north into the Chisos Mountains, the Mexican species which extend north into the region constitute an important element in the flora. Palmer (loc. cit.) gives an excellent account of the region.

Canyons of the Rio Grande.—At Boquillas, the river enters a deep canyon in the Edwards limestone. We collected in and about the head of the canyon on the American side. Further upstream the river has cut St. Helena Canyon, a narrow limestone gorge 7 miles long with almost vertical walls 1800 feet high. At the lower end, it was possible to proceed for collecting less than half a mile up the canyon.

Guadalupe Mountains.—These are a southern extension of the Sacramento Range. While most of the Guadalupes lie in New Mexico, the highest and the wettest portion of the range extends into Culberson Co., Texas. Guadalupe Peak (9500 ft.), the highest peak of the range, is the highest point in Texas. The ruggedness of the mountains results from the deep, steep-walled, narrow, tortuous canyons, incised in the thick Permian limestone of which the range is largely composed. Some of the canyons, McKittrick and Dog, contain sizeable permanent streams, and

² Palmer, E. J. Ligneous flora of the Davis Mountains. Jour. Arn. Arb. 10: 8-45. 1929.

support a mesophytic vegetation. In these cool moist canyons many northern species thrive. While a few Mexican species are found, such as *Selaginella Pringlei*, *Carex planostachys*, *Oryzopsis fimbriata*, the flora is dominated by Rocky Mountain species of more northern range. Some species are more common in the mountains of southern New Mexico and Arizona, and here make their eastern stand.

The Life Zones in the Guadalupe Mountains range from Lower Sonoran to Canadian. The characteristic vegetation of the Transition and Canadian Zones is found in the deep moist shaded canyons and on the high ridges and peaks. A few forms are endemic—*Tradescantia Wrightii*, *Sisyrinchium longipedunculatum*, *Laphamia quinqueflora*, *Valeriana texana*, *Polygala rimicola*, *Festuca ligulata*.

For many things which contributed toward the success of our collecting trip, we thank Dr. George T. Moore, Director of the Missouri Botanical Garden; Dr. J. M. Greenman, Curator of the Herbarium of the Missouri Botanical Garden; Dr. B. C. Tharp, University of Texas; Mr. E. J. Palmer, Arnold Arboretum; Mr. Homer Wilson, Del Rio, Texas; Mr. M. McAlpine, Toyah, Texas. We acknowledge the hearty coöperation of the following specialists who determined many of our plants: Dr. A. S. Hitchcock, grasses; Dr. W. R. Maxon, ferns; Dr. A. W. Evans, hepaticas; Prof. Oakes Ames, orchids; Mr. E. B. Bartram, mosses.

Sets of our "Plants of Texas" may be found in the herbaria at the following institutions (listed in order of size of set): Missouri Botanical Garden; Arnold Arboretum (ligneous plants only); Gray Herbarium; University of California; Academy of Natural Sciences of Philadelphia; University of Michigan; New York Botanical Garden; Stanford University; California Academy of Sciences; University of Minnesota; United States National Herbarium; Geo. E. Osterhout.

NOTES ON SPECIES NEW OR RARE IN THE FLORA OF TEXAS

BRYOPHYTA

HEPATICAE

Riella americana Howe and Underwood. Davis Mountains, 3081. From the only known station in the mountains, now probably destroyed.

MUSCI

Venturiella sinensis (Vent.) C. M. Guadalupe Mountains, 3524. Found for the first time in North America, growing on the bark of *Acer grandidentatum* var. *brachypterum*, in the upper part of McKittrick Canyon. Previously known only from Japan, China, and Korea.

PTERIDOPHYTA

FILICALES

Cystopteris fragilis (L.) Bernh. Guadalupe Mountains, 3561. Moist crevices among shaded boulders in Devil's Canyon. A southern extension of the range of a northern species. The first collection from western Texas.

Notholaena Greggii (Mett.) Maxon. Boquillas Canyon, 3348. Our collection of this rare Mexican fern, from crevices of the high exposed bluffs near the west end of the canyon, is the first made in the United States.

LYCOPODIALES

Selaginella Pringlei Baker. Guadalupe Mountains, 3502. A Mexican species collected only twice previously in the United States. On moist limestone ledges, along stream, McKittrick Canyon.

SPERMATOPHYTA

GYMNOSPERMAE

PINACAEAE

Cupressus arizonica Greene var. *bonita* Lemmon. Chisos Mountains, 3207. A small grove of trees in upper Boot Spring valley constitutes the farthest-east station for this species.

Juniperus flaccida Schlecht. Chisos Mountains, 3330. A Mexican tree known in the United States only from the Chisos. The pronounced weeping habit reminds one of *Thuja* or *Libocedrus*. At the heads of canyons and along streams in sheltered places.

ANGIOSPERMAE (DICOTYLEDONEAE)

AMARANTACEAE

Cladotrichia lanuginosa Nutt. var. *carnosa* Steyermark, Ann. Mo. Bot. Gard. 19: 389. 1932. Study Butte, 3795.

ASCLEPIADACEAE

Asclepias glaucescens HBK. Chisos Mountains, 3417. In sheltered rocky woods at head of Green Gulch. A species of Arizona, New Mexico, and Mexico, not previously reported from Texas.

BERBERIDACEAE

Mahonia repens (Lindl.) Don. Guadalupe Mountains, 3481. A northern species found here previously by Havard and Bailey. On moist shaded wooded slopes in McKittrick Canyon, and on the slopes of the ridge above the canyon.

BETULACEAE

Ostrya Baileyi Rose. Guadalupe Mountains, 3483. On the sheltered ridges above McKittrick Canyon, a small tree; in the canyon, a large tree. Known only from the Guadalupe and Chisos Mountains.

BORAGINACEAE

Lappula grisea Wooton & Standley. Guadalupe Mountains, 3583. Not previously collected in Texas. On moist shaded soil, McKittrick Canyon.

Lithospermum viride Greene. Guadalupe Mountains, 3648. A New Mexican species found for the first time in Texas. Limestone ledges along trail out of McKittrick Canyon.

CAMPANULACEAE

Campanula rotundifolia L. Guadalupe Mountains, 3449. Common in moist shaded grassy places, McKittrick Canyon. A northern form reaching the southern limit of distribution in the Guadalupe, Chenate, Davis, and San Antonio ranges.

CAPRIFOLIACEAE

Lonicera arizonica Rehder. Guadalupe Mountains, 3478. Shaded woods about the summit of Guadalupe Peak. The first collection from Texas.

Syphoricarpos rotundifolius Gray. Guadalupe Mountains, 3671. A northern species previously collected by Havard; in woods about Guadalupe Peak.

CARYOPEYLLACEAE

Drymaria gracilis Cham. & Schlecht. Davis Mountains, 3044. The northern limit for a Mexican species. Large clumps in sheltered soil pockets at base of bluff in Little Aguja Canyon.

COMPOSITAE

Actinea Richardsonii (Hook.) Ktze var. *floribunda* Gray. Guadalupe Mountains, 3676. New to Texas flora. Scattered colonies in *Pinus ponderosa* woods on the limestone ridge between Pine Canyon and Guadalupe Peak. A species commoner in central and southern Rocky Mountains.

Alopappus gymnocephalus DC. forma *albus* Steyermark and Moore, f. nov. Ligulis albis. Ridge above McKittrick Canyon, Guadalupe Mountains, Culberson Co. Texas, July 17, 1931. Moore and Steyermark 3488, TYPE in Herbarium of Missouri Botanical Garden. The ligules on all the heads were white, their color in the species being some shade of pale purple or pink. The species is commoner in the central Rocky Mountains and has been collected here by Havard.

Brickellia Coulteri Gray. Boquillas Canyon Region, 3438. A low slender subligneous plant, on steep rocky slopes at head of sand dunes at the mouth of the canyon. Our collection differs from typical *B. Coulteri* in having broader more obtuse involucral bracts.

Brickellia Fendleri Gray. Guadalupe Mountains, 3557. A northern species found for the first time in Texas. Moist shaded slopes in a ravine of Devil's Canyon, also in McKittrick Canyon.

Coreopsis lanceolata L. Guadalupe Mountains, 3632. This station on the high grassy ridges is the farthest-west record for the species in Texas.

Eupatorium Parryi Gray. Chisos Mountains, 3408. This rare Mexican species

was found in dry sheltered rocky woods growing in rich soil at the head of Cat Tail Canyon, close by the falls. Our collection, the second ever to be made, adds this plant to the United States flora.

Hieracium carneum Greene. Guadalupe Mountains, 3644. Open rocky slopes above McKittrick Canyon. A species of the southern Rockies of New Mexico and Arizona, previously collected in the Davis Mountains by Ferris & Duncan.

Hymenopappus radiatus Rose. Guadalupe Mountains, 3484. A species new to the flora of Texas, previously known from New Mexico and Arizona. On rocky open ground and in thickets of *Cercocarpus argenteus*, *Amelanchier floridana* and *Robinia luxurians*, on the high ridge north of McKittrick Canyon.

Laphamia quinqueflora Steyermark, Ann. Mo. Bot. Gard. 19: 392. 1932. Guadalupe Mountains, 3547.

Perityle Parryi Gray. St. Helena Canyon, 3466. Known previously in Texas by Havard's collection in the Bofecillos Mountains. In crevices at base of canyon walls.

Pinaropappus parvus Blake. Guadalupe Mountains, 3588. A rare suffruticose dwarf composite, forming large clumps in the shaded crevices of limestone cliffs. Found in the Texas Guadalupes by Standley and ourselves.

Solidago Wrightii Gray. Guadalupe Mountains, 3629. A rare species, this being only the second collection from Texas. At high altitudes on the ridges.

CRUCIFERAE

Sisymbrium diffusum Gray. Guadalupe Mountains, 3567. On limestone talus. Rare in these mountains; found previously in Texas in the Pena Colorado Mountains and Guadalupe Mountains by Havard, and by Wright on his El Paso expedition.

ERICACEAE

Arctostaphylos pungens HBK. Davis Mountains, 3145. A species of the mountains of Arizona, Nevada, and California, here recorded for the first time from Texas. On a rocky mesa and adjacent scrub oak slopes above Little Aguja Canyon, along with *Pinus cembroides* var. *edulis* and other shrubs.

EUPHORBIACEAE

Euphorbia eriantha Benth. Boquillas Canyon region, 3440. Rocky slopes at west end of Canyon. Rare, previously found in Texas by Hanson, at Redford.

FAGACEAE

Quercus hypoleuca Engelm. Davis Mountains, 3127. A rare oak, forming thickets about breast high on rocky slopes high above Little Aguja Canyon.

GENTIANACEAE

Frasera speciosa Dougl. Guadalupe Mountains, 3647. A northern plant known in Texas only from the Guadalupes. In open *Pinus flexilis* woods on high ridges.

GERANIACEAE

Geranium caespitosum James. Guadalupe Mountains, 3486. A northern plant reaching Texas only in the Guadalupes. On the high ridges in the open grassy *Pinus flexilis* forest. An oxylophile occurring with *Panicum bulbosum*.

HYDROPHYLLACEAE

Nama Hawardii Gray. Study Butte Area, 3248. On the gypsum flats associated with *Greggia camporum*. Other stations in the region are Hot Springs and the Tornillo Creek region.

Nama xylopodium (Wooton & Standley) C. Hitchcock. Guadalupe Mountains, 3562. Rock crevices and boulders along streams, McKittrick Canyon. Known in Texas only from the Guadalupe Mountains.

LEGUMINOSAE

Robinia luxurians (Dieck.) Rydb. Guadalupe Mountains, 3480. A northern tree known in Texas only from this range. On the high ridges, a shrub; in the canyons, a well-formed tree.

LINACEAE

Linum Schiedeanum Cham. & Schlecht. Chisos Mountains, 3225. A Mexican species now reported as an addition to the United States flora. In sheltered woods at high elevations near Boot Spring.

LOASACEAE

Menzelia asperula Wooton & Standley. Guadalupe Mountains, 3679. A rare New Mexican species found for the first time in Texas. On dry limestone talus, ridge north of McKittrick Canyon.

LOGANIACEAE

Buddleia marrubifolia Benth. Boquillas Canyon Region, 3449. A Mexican species collected previously in the United States along the Rio Grande by Parry. In a small ravine north of Boquillas Canyon.

LORANTHACEAE

Arculobium vaginatum Eichler. Guadalupe Mountains, 3470. On *Pinus ponderosa*. A common species in the Rocky Mountains but found in Texas only in the Guadalupe and Davis ranges.

MONOTROPACEAE

Hypopitys sanguinea Heller. Guadalupe Mountains, 3623. A northern species now reported for the first time from Texas. The entire plant is a deep scarlet-red and contrasts brilliantly with the leaf mould on which it grows. Shaded slopes in McKittrick Canyon.

Pterospora Andromedea Nutt. Guadalupe Mountains, 3642. On high ridges above McKittrick Canyon, in open *Pinus ponderosa* forest. A new record for Texas.

NYCTAGINACEAE

Boerhaavia erioselenus Gray. Boquillas Canyon Region, 3456. Known in Texas only in the vicinity of Tornillo Creek and near Hot Springs.

POLEMONIACEAE

Loeselia Greggii Wats. Chisos Mountains, 3344. Our collection from dry rocky sheltered draws, above Blue Creek Canyon, adds this Mexican species to our flora.

POLYGALACEAE

Polygala rimicola Steyermark, Ann. Mo. Bot. Gard. 19: 390. 1932. Guadalupe Mountains, 3515. This endemic *Polygala* was so small that the specimens had to be dug out of the rock crevices with a penknife.

POLYGONACEAE

Eriogonum Havardii Wats. Guadalupe Mountains, 3609. Grass land on foothills below McKittrick Canyon; otherwise known in Texas from stations in the Chenate and Bofecillos Mountains, and at Langtry.

Eriogonum pannosum Wooton & Standley. Guadalupe Mountains, 3617. A rare species hitherto not reported from Texas. On the foothills below McKittrick Canyon.

RANUNCULACEAE

Aquilegia longissima Gray. Davis Mountains, 3104. The long-spurred columbine (spurs 6 inches long) has been found twice in Texas. Havard collected it in the upper ravines of the Chisos Mountains. Our station in the upper portion of Little Aguja Canyon, a shaded nook under a sheer bluff, is the second known from Texas.

Clematis alpina Mill. Guadalupe Mountains, 3670. A northern species known in Texas only from our collection near the summit of Guadalupe Peak.

RHAMNACEAE

Rhamnus fasciculata Greene. Chisos Mountains, 3161. A species of New Mexico and Arizona found first in Texas by E. J. Palmer in the Davis Mountains; our station in the Chisos is the second for Texas.

ROSACEAE

Eriogynia caespitosa Wats. Guadalupe Mountains, 3653. Shaded upper part of McKittrick Canyon, forming dense prostrate matted clumps. A rare species of higher latitudes, occurring in Texas only in the Guadalupe Range.

Holodiscus dumosus (Nutt.) Heller. Guadalupe Mountains, 3672. Our collection on the north-facing slopes of Guadalupe Peak links the northern distribution of the species with the outlying station found by E. J. Palmer on Mount Livermore in the Davis Mountains 100 miles to the southeast.

Prunus Havardii (Wight) Mason. Chisos Mountains, 3230. A rare shrub known formerly only from the collections of the Mexican Boundary Survey and of Havard from the Chisos Mountains. Our specimens were found at the head of Blue Creek Canyon. The gamosepalous calyces remain attached with the stamens to the fruit until maturity, and appear at first glance to be dried corollas.

Rosa mirifica Greene. Guadalupe Mountains, 3540. New to Texas flora, a rare species throughout the rest of its range. Along the stream, McKittrick Canyon.

Vauquelinia angustifolia Rydb. Chisos Mountains, 3203. A handsome shrub with the aspect of *Sorbus*; the flowers are fragrant. Known in the United States from this mountain range only. Gravelly banks, Oak Canyon and Blue Creek Canyon.

SAXIFRAGACEAE

Ribes mescalero Coville. Guadalupe Mountains, 3689. Very rare outside type locality. On steep slopes below Guadalupe Peak.

SCROPHULARIACEAE

Pentstemon baccharifolius Hook. Boquillas Canyon region, 3450. High limestone hills along Boquillas Canyon, the farthest-west station for this species in Texas, more common on the Edwards Plateau.

VALERIANACEAE

Valeriana texana Steyermark, Ann. Mo. Bot. Gard. 19: 393. 1932. Guadalupe Mountains, 3528.

VERBENACEAE

Bouchea spathulata Torr. Boquillas Canyon region, 3446. Collected previously in Texas by Hanson and Havard. Rock ridge above canyon. The plants are suffruticose at the base, have thick coriaceous leaves, and bright purple corollas.

MONOCOTYLEDONEAE

BROMELIACEAE

Tillandsia recurvata L. Chisos Mountains, 3198. Although the usual habitat of the plant is trees or telephone wires, it was found growing on smooth vertical cliff faces below Emory Peak.

COMMELINACEAE

Tradescantia Wrightii Rose & Bush. Guadalupe Mountains, 3578. This rare endemic has been previously collected by Havard, Wright, and by Standley. Our collection, the fourth ever to be made, was obtained from plants growing on rocky banks along the stream, McKittrick Canyon. The corolla is dark purple and the tuberous roots are long and slender.

CYPERACEAE

Carex microdonia Torr. & Hook. Guadalupe Mountains, 3511. The first record for western Texas. Moist grassy places along the creek in McKittrick Canyon.

Carex eburnea Boott. Guadalupe Mountains, 3572. At base of moist shaded limestone bluffs in McKittrick Canyon. Our collection represents the farthest-west station for the species. The only other record in Texas of this eastern and northern type is a collection from Harriman, Texas, by Ruth (U. S. National Herbarium).

GRAMINEAE

Festuca ligulata Swallen, Amer. Jour. Bot. 19: 436. 1932. Guadalupe Mountains, 3576.

Sorghastrum nutans (L.) Nash. Guadalupe Mountains, 3628. A new southwestern limit for this species. Sandstone outcrop on ridge above McKittrick Canyon.

Sphenopholis obtusata (Michx.) Scribn. Guadalupe Mountains, 3564. The farthest southwest for the species.

LILIACEAE

Zygadenus elegans Pursh. Guadalupe Mountains, 3564. On moist shaded limestone cliffs along the stream in McKittrick Canyon. This is the first collection from Texas, a record extending the distribution of the death camas southeastward.

ORCHIDACEAE

Ameria gigantea (Dougl.) A. Nels. & Macbride. In the Chisos Mountains at the head of Cat Tail Canyon, in rich leaf mould associated with a most virulent species of poison ivy, 3406. Along the stream in McKittrick Canyon, Guadalupe Mountains, 3568.

Spiranthes salsensis Ames. Chisos Mountains, 3214. Prof. Ames informs us that there are but two other collections of this orchid, both from central Mexico. Ours is the first to be taken in the United States.

POTAMOGETONACEAE

Potamogeton clystocarpus Fernald. Davis Mountains, 3088. This new species, described by Professor Fernald from our collection, occurred in shallow rock pools along the stream in the upper portions of Little Aguja Canyon. We regret to learn from Dr. R. A. Studhalter that in September, 1932, the region was visited by a cloudburst which washed the canyon clean of aquatic vegetation.

Potamogeton diversifolius Raf. Chisos Mountains, 3186 and 3414. The usual form with floating leaves (3186) was found in the creek near Boot Spring, while the rarer submersed form (3414) was found in a still deep pool at the head of Cat Tail Canyon. The latter were slender nearly sterile plants about 20 inches tall. All the leaves were submersed and linear. This species was also found in the upper part of Little Aguja Canyon in the Davis Mountains.

ADDITIONAL RECORDS OF INTEREST

The following is a list of plants for which we found new stations or which are rare in Texas. Our collection numbers are cited with each species mentioned. Abbreviations indicating the regions to which records refer, are as follows:—

- | | |
|----------------------------|---------------------------|
| (C) — Chisos Mountains. | (S) — Study Butte Region. |
| (D) — Davis Mountains. | (H) — St. Helena Canyon. |
| (G) — Guadalupe Mountains. | (B) — Boquillas Canyon. |

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